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METHODOLOGY OF MILITARY -- SCIENTIFIC RESEARCH

By

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METHODOLOGY OF MILITARY--SCIENTIFIC RESEARCH

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This book gives an analysis of the methodology used in military-scientific research. The authors examine the characteristics of such research and the Marxist dialectic method, logic and statistical method used in it; also discussed is the process of military-scientific research and recommendations on the literary finalization of a scientific work and on the preparation of a manuscript for the press; the methodology for organizing military-scientific work is discussed in detail. ()

The book was prepared by a group of authors at the Military Academy Imeni M. B. Frunze.

Since the experience in analyzing the methodology used in military-scientific work still has not been adequately generalized, and since a work of such a nature is published for the first time, the authors and publishing house ask officers and generals working in the military science field to send to the publishing house their comments, reviews, desires and recommendations of a practical nature concerning the contents, structure and form for exposition of the materials in this book. The address for such communications is: Moscow K -- 9, Tverskoy Bul'var, 18.

Foreword

The Twenty First Congress of the Communist Party of the Soviet Union, in laying out a grandiose program for accelerated construction of Communism, again has demonstrated to the entire world the tremendous force and power of our socialistic state and its progressive peace loving policy. However, in building Communism, the Soviet people are fully taking into account that imperialism still exists, and this means that there is a danger of external attack on our country.

The complexity of modern internationl conditions and the interest of the defense of our Motherland against the aggressive actions of its enemies require that the fighting capacity of the Soviet Armed Forces be increased and strengthened. A highly important means for attaining this objective is the further development of Soviet military science. V. I. Lenin taught: ". . . a modern army cannot be built without science" [1].

The rapid development of modern military technology, the supplying of the Armed Forces with this new complex equipment and significant qualitative changes in the personnel of the army in themselves exert a significant effect on preparations for and conduct of military operations in war as a whole and require a profound theoretical development of many aspects of military affairs. The proper solution of practical problems in the field of military preparation of the armed forces and their military use is dependent on how correctly and thoroughly various military-theoretical problems are formulated

The need for further development of military science, research and the mastery of the most significant present-day methods for armed combat have led to the extensive development of military-scientific work, the large scale participation of generals and officers from the armies, military institutes, and military-academic schools in this work. Military-scientific work has become an indispensable part of the everyday service activity of every Soviet general and officer.

Naturally, under these conditions the need has arisen for a manual which sets forth the basic problems involved in the methodology for military science research, the procedures and methods for conducting work in the field of military science.

This book also has the objective of responding to this need and insofar as possible rendering assistance to generals and officers in conducting research in the field of military science in order to facilitate the development of Soviet military science and increase the quality of military science publications.

It is known that any science, in addition to a definite system of knowledge and information concerning the object of its research, also includes a group of scientific methods by means of which this information and knowledge is acquired, that is, its methodology. A problem of the methods for theoretical research is of very great basic importance because in actuality scientific conclusions and findings can be made only if the research has been conducted on the basis of a correct method. The character of the methodology of scientific research is dependent to a large extent on those peculiarities which characterize the phenomena studied by the particular science. In this sense each of the sciences has its methodology as a group of methods for theoretical research, determined by the specific nature of the corresponding science.

In this book an attempt is made to set forth the basic problems involved in the methodology of military science research in a systematic form. The book sets forth the characteristics and method for research on military problems and the essence of the process of research in the field of military science. It also gives some practical advice concerning the selection of a subject, the planning of military science research, collection of materials, work on sources in the literature and archives, use of the experience in military exercises and maneuvers, and the literary finalization of works on military science and their preparation for the press.

In this book much attention is given to the use of the Marxist dialectic method in research in the field of military science. In addition, it examines the application of logic and military statistics during a study of various military problems. The final chapter deals with certain problems in the methodology of organizing a treatise on military science.

Although this book does not make any pretense at an exhaustive discussion of this complex and multisided subject, unquestionably it will be of great assistance to officers and generals in organizing and conducting work in the field of military science.

General of the Army P. A. Kurochkin

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Chapter I.

CHARACTERISTICS OF RESEARCH IN THE FIELD OF MILITARY SCIENCE

1. Object of Research in Military Science.

Each science has its own subject matter for research. For example, the field of mechanics is concerned with study of the motion of bodies in space and time, botany is concerned with the life of plants, their structure, vital functions, etc., and the social sciences are concerned with various phenomena in social life.

Military science is one of the social sciences. The object of its research is war, constituting an extraordinarily complex and varied social historical phenomenon. Modern wars are conducted by people. They involve all the energies and resources of the combatting states, since war is a thorough testing of all the material and spiritual forces of every people; it is a competition not only of military, but also economic resources and the moral forces of the combatting sides. Preparations for and the conducting of a war have a complex and highly varied character and include a very wide range of problems and aspects.

Naturally, military science alone cannot cover the research of all aspects of preparation and conducting a war. War is studied from different points of view by a whole series of sciences: political, economic, historical, technical, and others.

The origin of wars, their class -- political nature and other problems associated with wars as a phenomenon of the social life of class society is investigated by the Marxist-Leninist science in its teachings concerning war and the army. The problems of specific economics in war are investigated directly by the various economic scientists. Work on scientific and technical problems involved in a war is the subject matter for a number of special sciences.

However, the object of research in military science is primarily the armed struggle, the direct conduct of the war by military equipment and methods. The armed struggle constitutes the specific nature of war as a social phenomenon and the existence of these specific characteristics makes necessary the existence of a special science.

However, this does not mean that the object of research in the field of military science is restricted only to problems involved in methods for conducting military operations and war as a whole, that is it is not restricted for the military art. In former times, when wars were conducted only by professional armies using their resources of material equipment, created in peacetime, the subject of military theory, which was in its incipient state, was primarily the study of the simplest means and methods for military operations. However, with the development of the military art, increase in the scale of the armed struggle, the object of military science became increasingly broad. The experience in the last, and particularly the two world wars, demonstrated very convincingly the ever increasing effect exerted on the course and outcome of armed struggle by economic and moral-political factors. Therefore, the study of these factors, both of our country, and of countries representing probable opponents and the determination of their effect on the preparations for, course and outcome of the war, its campaigns, operations of different types and battle also enters into the field of military-scientific research.

Under modern conditions military operations are conducted on the ground, in the air, on the sea, and in different theaters of military operations. The destruction of the enemy and the attainment of the overall strategic and military-politicalobjective of the war is brought about by a whole series of military efforts at different scales. The intermediate objectives of the war on the road to its final objective are attained by conducting military campaigns involving a number of different kinds of operations. A decisive factor in obtaining the objectives of an operation is played by battles, which are the only means for annihilating the enemy and suppressing his capacity for resistance. Therefore, the object of research in military science is both war as a whole and its individual phenomena, campaigns, operations and battles conducted under various military battle conditions.

In the study of war and its various aspects, military theory has its single objective: to find those forms and methods of operation which will insure victory over the enemy in armed combat at any scale with a minimum of loss of personnel and equipment and in the shortest time. Because of this the forms of armed combat and the methods for action of armies in battle, operations, in the war as a whole, and during its individual periods under different conditions are at the center of study in the field of military science.

The military operations of armies at any scale are inseparably related to the combat (operational), material, technical and other types of support. In addition, together with conducting combat operations, the army can perform movements outside the field of battle as well as on the field of battle, regrouping, taking position, etc. The military activity of armies is exceptionally varied. Therefore, the field of study in military science is not only the direct conduct of armed struggle, but all the activity of armies directed to insuring their battle readiness and capacity for conducting military operations.

Armed struggle is conducted by men who are organized, armed and technically supplied in a definite way. Therefore, victory is dependent to a decisive degree on the political-moral condition of the armies, but also on the effectiveness of the political work which is done with them. Because of this the content of the political work with armies, the organization form and methods of its conduct are also an important aspect of study in the field of military science.

The direct conduct of armed struggle is carried by armed forces specially created for this purpose. Therefore, the problems involved in building up armed forces, their organization, formation, control, technical supply, instruction and training of personnel, preparation of subunits, units, divisions, and armies, staffs and command units are also an object for study by military science.

An inseparable attribute of the armed forces are the means for combat, armament and military equipment which are created exclusively for purposes of war and armed combat. Only by means of using armaments in battle is damage inflicted on the enemy, both to his personnel and his equipment. There are no other means, other than the direct use of armaments in inflicting on the opponents by means of this armament by which victory can be achieved in armed combat. Moreover, without the knowledge of the means for combat and the methods for their use it is impossible to conduct a modern war. Victory in battle is achieved by means of weapons which are controlled by men. The more effective is the armament itself and its use the more rapidly can the victory be won. Therefore, study of the status and prospects for development of various means of combat, their role and military possibilities, methods for use in various kinds of military operations and under different conditions are some of the most important problems dealt with in military science.

Soviet military science does not study some abstract war, but war in general. V. I. Lenin taught us to regard war as the continuation of the policy of the interested powers and the classes within them and to approach the study of war from specific points of view. Under modern conditions the threat of military conflict must be expected primarily in the aggressive policy followed by the imperialists. Therefore, Soviet military science studies primarily the character of modern war.

However, military science is concerned not only directly with a future war. It also studies the experience of development of the armed forces and military art in the past. However, this problem is not a goal of its own in military science. By investigating the experience of development of military operations in the past military science determines the patterns in this development and determines the trends in change of the form and methods of armed combat which appeared in the course of past wars. Thus, the experience of the past is put to use in the present. To use the expression of M. V. Frunze, the need for studying the experience of the past can be expressed as follows " . . . to draw from the past conclusions which will be of service tomorrow" [1]. The experience of the last and greatest war is of particular importance in this respect. A critical use of the very rich experience of the Great Fatherland War of the Soviet Union, in combination with a thorough analysis of present day conditions and the development of technology can insure the drawing of proper conclusions concerning the characteristic features and peculiarities of a future war.

The experience of past wars, military exercises, war gains, command and staff exercies, maneuvers and proving ground tests of military equipment and armament in peace time are the sources which supply military science with facts, conclusions and generalizations and insure the development of military theory. In science nothing must be taken on faith. In science the reliance is on facts, generalizations and conclusions based on a study of an abundance of factual data and the checking of these conclusions on a practical basis.

Thus, the object of study in military science is primarily armed combat that is, all the problems involved in preparations for, conduct and supporting a war as a whole, its campaigns, operations and battles. However, since armed combat is conducted by armies using a wide variety of means and methods of operation, the object of study in military science includes primarily such categories as armed forces, combat equipment, forms and methods of military

operations under various conditions. Since armed combat and its results are dependent on economic and moral-political possibilities of the combating countries, the scope of research in military science also includes problems involved in taking these possibilities into account and determining their effect on the course and outcome of battle, operations and the war as a whole.

2. Specific Characteristics of Military Science Research.

Military science research, like any other research, is guided by by the general procedures and rules of scientific methodology. However, since the principal object of military science is such a specific social phenomenon as war, research in military science, while being guided by the general principles of scientific methodology, also has its specific characteristics. These characteristics are expressed in an extreme restriction of experimentation, in the wide variety and exceptional complexity of the investigated phenomena.

Military science, like any other science, is based on practical work, on experience, and is a scientific generalization of military practice and military experience.

However, in military science work has its special characteristics. It is impossible to draw an exact analogy between the character of the practical work on which such sciences as physics or chemistry depend and the character of the practical work by which the data obtained in military science are checked. Physics and chemistry can check the principles of their science in laboratories, creating appropriate conditions for the experiments. The positive or negative results of the experiments demonstrate or refute the correctness of some scientific principles. New conclusions drawn by physics and chemistry are also checked in industry, in the national economy. Thus, in the field of physics, chemistry and the other natural sciences it is possible to check any new principle with great accuracy in the course of a relatively short time.

With respect to the principles of military science in general, they cannot be checked by such methods. The full checking of the validity of all the principles and conclusions in military science, as is well known, can be accomplished only during wartime. However, not any war can serve as a true measure for the evaluation of the correctness of military science, but only a war with a strong fulfillment. In history cases have been known when the victory of one of

the sides occurred because the ruling classes on the other side did not wish to inspire the people to a straining of all their efforts in combat against the enemy.

However, wars, particularly large ones are not a common phenomenon, if this matter is regarded from the point of view of an individual country and its armed forces. Moreover, a war continues for a relatively short time and is not a continuous state of society. However, military matters do not cease to develop even in peacetime, which lasts a longer time than does war. Nevertheless, during this period research in the field of military science is conducted under conditions in which the researchers cannot observe and study true wartime phenomena, its operations and battles. In essence, during this period the researcher cannot directly come into contact with the phenomena which he studies.

However, even during the course of a war the possibilities of the military researcher are extremely limited. Under present-day conditions he is unable to observe the entire field of battle, much less observe the entire operation. At best he can see the battle in one sector in an insignificant depth and then, by no means with all its details. Many details of battle will always remain beyond his field of view. All this forces the military researcher to be concerned primarily with battle documents, making use of the reports of participants in battle and only to a certain degree can he rely on his personal observations.

However, whereas military research in military science during peacetime it is rare to come into direct contact with the investigated fact itself, that is, with a true experiment, it is naturally impossible to completely exclude experimentation as an element of research. Many problems in military science can be studied under experimental conditions and during peacetime. In particular, experimentation finds use in the checking of the combat properties of various types of weapons and battle equipment. It is also possible when checking some operational and tactical problems during maneuvers and military exercises.

However, when speaking of exercises and maneuvers, as well as proving ground tests during peacetime it must always be remembered that even when they are conducted as carefully as possible they can never recreate the true picture of war, battle and operations, since a real opponent, his will and counteraction are absent. They can provide only some approximation to these conditions. Despite this, it is impossible to neglect such experimentation during research in any circumstances because this experimentation under [illegible]me conditions is the only

possible laboratory in which we can check the correctness of any theoretical principles. The importance of this laboratory work is exceptionally great because under peacetime conditions only this method of checking is available to the armed forces of any country.

Proceeding on this basis, it is necessary to make broader use of all the experimental possibilities of peacetime and not exclusively proving ground tests, army and experimental exercises and maneuvers, field exercises and war games, but also exercises conducted with officers and generals, and for study of the operations of small subunits, also with sergeants and ordinary soldiers. However, in order to obtain useful information for study in military science from these exercises they must deal with and solve new problems and have research purposes as well as ordinary training objectives. This type of arrangement is extremely necessary as one of the immediate approaches to a constant contact between work in the field of military science and the training of armies.

Since the possibilities for experimental checking of new principles in military art during peacetime are limited by the absence of a real living enemy, increased demands must be imposed on experimental methods. The army and staff during maneuvers, army and command-staff exercises must simulate as closely as possible the circumstances associated with military reality. During all peacetime exercises it is necessary to take into account as completely as possible the probable operations of a strong enemy, his degree of cover action, and not allow simplifications in the conduct of exercises by a preliminary study of the region in which the exercises are conducted, improvement of the road net ahead of time and elimination of natural obstacles, selection of favorable weather and terrain which is easier for the operation of armies, etc.

In addition to the extensive use of experimentation during peacetime it is also necessary to make a thorough use of the experience of past wars, and particularly the most recent large war. It goes without saying that in no case is it possible to ignore the experience of small local wars during recent times. They must be studied and analyzed attentively and thoroughly.

The extensive use of the experience of war is of enormous importance in military science research. It provides the researcher with abundant material for reflection, comparison and generalization. The experience of wars is in essence very real, very complete experimentation. However, this experimentation,

despite all its merits, is already outmoded, since a future war can never be the same as an earlier one and those who have attempted to conduct a new war like some past war have always experienced defeat. Therefore, a study of the past is not an objective in itself for military science, but is only one of the means for learning about the present and the future.

The principal objective of military science is to open the road to the future, to facilitate the finding of new ways to conduct and develop military operations. Soviet military science is strong in that it is not limited to collection of the experience of the past, but by making use of the uniquely scientific Marxist-Leninist methodology, it also makes known new approaches. Taking this into account, in the study and generalization of the experience of war an effort must be made to detect the most characteristic, typical features in the methods of operations for armies and establish patterns and tendencies in the development of forms and methods of armed combat. It is very important to be able to correctly determine what new phenomena were developed in a past war which may be developed extensively in a future war and what phenomena may lose their former importance and pass into oblivion.

V. I. Lenin teaches that " . . . if one examines whatever social phenomena that he may wish in the course of this development, he will always find remnants of the past, the basis of the present and the embryo of the future . . ." [2]. Therefore, in the study of the experience of a past war the problem is to detect in it hints of the future and use them in practical activity at the present time.

The experience of war must be analyzed from the point of view of new attainments in military theory and practice, the status of armaments and military equipment, as well as the moral-fighting qualities of the armed forces.

One of the characteristics of research in military science is its multisided character. This multisided character is manifested in the fact that in the study of any wartime phenomenon we cannot isolate it and study it independently from other phenomenon, but on the contrary we are forced to take into account simultaneously a great number of factors in their totality.

Thus, war and its laws cannot be studied in isolation from social life, from the policy of the classes in whose interests it is conducted from the social and state structures of the combatting sides or from the attained level of development in production, science and culture.

In a study of any method of operations one must simultaneously take into account varied means for destruction and consider them from different aspects: positive properties, which it is necessary to use to the maximum extent, and shortcomings which must be compensated by the use of other means; problems which can be solved by a particular means during battle and operations, taking into account their combat possibilities; conditions which must be satisfied by the methods for using a particular weapon. In addition, one must take into account various means for protection and support, problems involved in the joint use of all combat resources, all kinds of armed forces and types of armament and the moral-real qualities of personnel, organization of the military forces and other factors.

However, allowance for these considerations alone still does not provide bases for determining the methods for operations by armed forces in combat because the latter are not determined on a general basis, but in relation to a specific enemy, having his own points of view concerning the conduct of military operations, his own combat technique, a particular moral and willpower status of his forces and his own organization of armed forces. Therefore, in order to study any method for the operation of armed forces it is necessary to study not only the factors already mentioned, but to study the enemy thoroughly, determine his possible counteraction and his weak and strong points. One must also take into account the peculiarities of the terrain because in mountains armed forces will operate differently than in dry deserts, and the season of the year, time of day and meteorological conditions must be considered.

Thus, in military science research from multisided character is manifested so completely that it is even difficult to make an analogy with research in the other sciences. The military researcher must deal with constantly changing means of combat, characteristics and capabilities of armies, which in addition can be used under extraordinarily varied conditions, exerting an effect on the methods and procedures for their combat use.

All this, together with the limitation of experimentation, is responsible for the complexity of military science research.

In military art research can be conducted from the determination of a method of operations of small subunits to a war as a whole; from determination of the methods for tactical use of some type of weapon or ammunition for determination

of methods for practical, operational and strategic use of atomic, thermonuclear and other means of mass annihilation of the enemy.

Military science in a study of the forms and methods for armed combat relies on data from a whole series of other sciences and makes maximum use of the attainments in all other fields of knowledge. Under the conditions of rapid progress of science and technology this dependence is increasing more and more. Therefore, the military researcher must constantly watch all the scientific and technical attainments and correctly determine the possibility for their use in military operations.

The complexity of research in military science is also manifested in the fact that the researcher draws conclusions for a future war; he is always forced to look forward and visualize the character of the changes which may occur during wartime. For example, when determining the economic potential it is inadequate to determine the productive capacity of the enemy today; one must look forward to see how they may appear during wartime. How will the enemy be able to reorganize his industry onto a wartime basis? To what extent can he increase its productive capacity? To what degree will industry be supplied with strategic raw materials? It is necessary to take into account definite alliances of combatting powers because one of the sides may not always have all types of raw material available and be forced to import it from other countries. These countries may be either hostile to this side or be neutral. In addition, although they may be on a particular side, with the onset of war the approaches to these countries may be cut off. Moreover, the continuity of operation of industry in an enemy state will be highly dependent under present-day conditions on the strikes of our air force and missiles.

Therefore, it is necessary to what extent this can reduce the productive capacities of the enemy and what must be done in order that they be reduced as far as possible.

In developing problems involved in tactics, operational art and strategy as a whole, the researcher takes into account those combat resources and personnel which a country has allocated for conducting a war. At the same time, he must take into account the prospects for the development of combat resources and changes in manpower and with this taken into account he must foresee changes in the methods for conducting military operations. However, in glancing constantly

forward the military researcher must not lose sight of the material base. Otherwise, his research is transformed into unreality and old guesswork. On the other hand, the military researcher, in working on the problems involved in tactics, operational art and strategy, must not only reckon with the material base and use it as a point of departure, but in turn must also visualize the possible further development of this base and give orders for this development.

All this indicates the great complexity and specific character of research in military science, that the military researcher must have a broad and varied point of view and a profound capacity for scientific intuition.

Work in military science requires great devotion, forwardness, persistence, patience and concentration. The words of Marx are completely applicable here: "In science there is no broad and clearly marked road, . . . and its shining peaks can be reached only by those who stumble along its rocky trails without fearing weariness" [3].

3. Forms of Work in Military Science

The forms of work in military science can be very different. They are dependent on the conditions in which the research in military science is organized and conducted, the character of the service activity of a particular general and officer, their level of training, work experience and other factors. Among the very different forms everyone who aspires to work in military science can select that form which is most suited for him because of his scientific training and which corresponds to his activity in the armed forces.

One of the most important forms of work in military science is the preparation of publications in military theory, military history and military technology.

The preparation of theoretical studies directed to the solution of various problems in military art is very difficult and assumes that there will be higher research. Therefore, in preparing such studies it is necessary to adhere through all the stages in the process of research in military science and there must be great scientific creativity. A research study without fail must contain the conclusions drawn by the author (authors) on the investigated problem and facilitate a positive solution of this problem.

Studies of this character are very different in scope and significance and their results reach a limited or extensive audience in a very great number of

channels. However, they all are of great value for military science. The intensity and the productiveness of such research exerts a decisive influence on the development of military theory. Their absence or inadequacy results in a stagnation of the development of military theory and therefore errors in the combat training of forces and serious miscalculations in preparation of the country for defense. Similar results stem from an incorrect formulation of such studies. Incorrect conclusions adopted into military theory can result in the taking of an erroneous direction in the organization and combat training of the armed forces.

The next very important form of work in military science is the development of various regulations: rules, regulations, instructions, manuals, etc.

A complete unanimity of points of view on the basic problems involved in military organization, training and instruction of forces, organization and conduct of combat operations and uniformity in the content and methodology of combat training during peacetime can be attained only on the basis of regulations meeting present-day performance and as completely as possible covering various aspects of the activity of the armed forces during peacetime and wartime. Even the most advanced study in military theory will be of no assistance if the armed forces do not have regulations or if these documents are of a low quality.

The creation of publications in the nature of regulations is based on all preceding and especially major theoretical studies and on the practical experience of the armed forces. These studies are prepared by generals and officers who are well trained in military theory and who have the necessary practical experience and a profound knowledge of military affairs.

The preparation of academic materials having a research and creative character, as well as scientific methodological studies on the problems of training and instructing the armed forces is also one of the forms of work in military science. Materials of an instructional character are a completely necessary link in imparting the attainments of military theory and the requirements imposed by regulations to the armed forces. It is by means of appropriate instructional materials that it is possible to insure a thorough and creative mastery of regulations. The professors and instructors at academies play the most important role in this form of military science work. However, everyone who because of his service assignment is obliged to conduct exercises at

academic institutions and in the armed forces can participate in this work to one extent or another.

An extremely effective form of work in military science is study of the problems involved in tactics, operational art, organization of armed forces and other problems involved in conducting experimental, tactical and command-staff exercises and maneuvers. In the course of organizing and conducting such exercises and maneuvers the most important problems involved in the further improvement of the methods and procedures for training and conducting battle and operations, the use of various kinds of armed forces and weapons are solved. Accordingly, during exercises and in maneuvers it is necessary to set definite research objectives, manifest creativity and initiative in solving the formulated objectives and constantly strive to find new contributions to the methods for operation of armed forces. This type of work in military science makes it possible to involve a very great number of personnel in the armed forces. In reality, all the participants in each specific exercise can participate in this work.

Tests of new equipment for armed combat play a significant role in military science research. The preparations for and the conduct of such tests and the generalization of their results is also one of the types of military science research. The tests reveal not only the capabilities, properties and design and construction inadequacies of the tested type of armament or equipment, but also reveal the effect which they can exert on the development of tactics and operational art.

Such tests can be conducted in special proving grounds, in laboratories and during exercises with the participation of officers and generals of all or only the types of forces particularly concerned, military engineers and designers and individuals directly participating in the operation and repair of this armament. The broad participation of all categories of interested individuals in the tests can exert a considerable assistance in perfecting the tested equipment.

The writing and defense of dissertations for the award of academic degrees, the writing and publication of articles on timely subjects and the writing of scientific reports are also necessary types of work in military science.

The types of work in military science also include the holding and conducting of military science conferences, meetings and scientific gatherings. These

types of work make it possible for a wide range of generals and officers to participate actively in military science work and arrive at the necessary unanimity of points of view on various complex problems in military art. As a result of creative discussion of problems in military theory and bold criticism of incorrect points of view and theories it is possible to obtain a more profound understanding of a phenomenon, discard antiquated points of view and make evident the correct ways for solving problems.

In the course of discussion it is possible to establish a common point of view and obtain new reasonings and factual data on highly important problems in the theory and practice of military operations. A discussion must be held in the form of a creative debate with a free exchange of opinions. Generals and officers, even the most experienced in conducting research in military science, can obtain much very useful information in such discussion.

Another important type of work in military science is the formulation of rationalization proposals and inventions directed to the further improvement of armament, battle equipment and methods for their care and practical use, as well as procedures for training of the armed forces. This type of work is expressed in the fabrication of new instruments and graphic manuals, in the improvement of work on specific components of mechanisms, in the introduction of advanced methods for operation, care and repair of military equipment, in the saving of funds and equipment, etc. In accordance with the existing law, the initiators of rationalization proposals are awarded certificates attesting to the technical improvement or certificates recognizing their proposals and inventors are awarded patents.

The writing of military science studies can be done by specialists in military science, generals and officers, either individually or as groups.

In the case of individual work there is a great amount of independence in writing and presenting the material. The author personally prepares the entire draft of the research project from beginning to end and is responsible for the literary presentation of the study. This type of work is successfully used when writing articles, reports and summaries of exercises and tests which have been performed, monographs, academic manuals, dissertations, etc. However, it must be remembered that in the solving of major problems in military science this method involves prolonged work by the author on the subject being investigated and usually requires a very long time.

However, the complex present-day international situation and the rapid development of scientific and technical thought urgently dictates the formulation of methods for conducting battle and operations in a short time. This makes it necessary to apply the group method for preparation of studies in military science and conducting military science research on a broad scale.

Present day military operations are distinguished by the great variety of the equipment used and the use of various kinds of armed forces, types of armies and special forces and such a considerable specialization of individual branches that even a military specialist with great erudition has difficulty in comprehending the totality of military problems. This is the second factor making it necessary to employ groups of researchers, rather than a single author, for the successful solution of major problems and the writing of major treatises on military theory.

The group type of work also adds a number of other positive characteristics: it insures an increase in the number of young workers in the field of military science; it creates favorable conditions for the application of the critique method in everyday work, for the regular checking of the work done and the rapid detection and exclusion of errors; it incorporates the experience and knowledge of many workers in the field of military science in solving a single common problem; the harmonious atmosphere prevailing among all members of the group exerts a stimulating effect on the individual creative process, and as a result it is possible to perform difficult and complex tasks in a short time.

At the present time, in order to achieve progress in military science on an organized and solid basis it is necessary to combine the efforts not only of individual workers in the field of military science, officers and generals, but also entire groups working in various fields of military knowledge and various sciences. The group type of work in military science is now acquiring decisive importance.

Group work can be accomplished in an academic department, division, staff, in a group of officers and generals, etc., or in a group of academic departments, divisions, staffs, etc., or by a team in a single academic department, division or staff with specialists being drawn from other groups. All these types of group work are determined by the scope of the research problem and the time allocated for the work.

The group form for the preparation of scientific research writings requires a well conceived plan and a clear guidance of the group's work. The latter is expressed primarily in a proper distribution of the volume of work among the members of the team, a precise formulation of the basic principles and directions for the work of the authors, in the exercise of control or the quality and deadlines for the work of each author and rendering them day -to-day assistance and in establishing a uniform style and imparting a rigorous purposefulness to the entire study.

In group work on a study a great danger arises of the transformation of the research into a collection of individual articles which are unrelated to one another in uniformity of purpose, internal content and style.

All this imposes heavy obligations on the director of the scientific team and increases his role and responsibility. The director of the scientific team must have much personal knowledge, experience, scientific authority and capabilities as an organizer. He must be able to guide and direct the work of others, keep under his control all the units of the work during all its stages and actively assist all the members of the team in solving basic problems. If the director is restricted solely to answering the questions of individual workers he is at best transformed into a consultant.

Experience shows that at a single time it is possible to direct only a single team of authors who are working on an important problem if productivity is to be achieved. In this case the director will be absorbed with the problem being worked on and this absorption will be shared by the entire team.

The attitude of the work director towards his subordinates is of very great importance in scientific work. These attitudes must be formed on the basis of mutual respect. The director must appreciate each scientific worker. All kinds of people can be present in a large group working on a scientific problem: those with initiative, those who are really absorbed, those who simply are working along, and those with a clearly expressed tendency to criticize everything. Under proper guidance they can all make a useful contribution to the overall group work and successfully perform the tasks delegated to them. Each of them must be approached on an individual basis and delegated work in accordance with their capabilities. The director must have the ability to organize and unite individuals, inspire them and eliminate obstacles in the work.

Academician N. Semenov, winner of the Nobel Prize, states: "A director must not only cultivate individuals with intiative but also create a vigorous creative group of scientists who will learn not only from him but from one another. He must bring about a situation in which they boldly and decisively express their point of view and at the same time listen to the opinion of the group. Such a team not only learns from the reader, but the director learns from the team: an excellent atmosphere of joint creativity is created, from which I personally obtain enormous enjoyment. All the time a person remains young and one's science moves rapidly forward and is fascinating. Indeed, a creative group is not the sum of creative individuals but something far greater" [4].

The team members must attentively listen to all the instructions and orders of the director, work in close contact with one another and constantly be aware of the solution of problems by members of the team working on related subjects. They must approach the implementation of their assigned tasks creatively, they must seek the simplest and most precise solutions when solving problems, they must confer with the leader when new ideas occur to them and they must seek new ways in which to conduct research. A team member can be carried away by erroneous ideas which an experienced leader can point out in time. The leader must not correct erroneous ideas harshly, not with a sneer, but gently, carefully, gradually bringing the author to the conclusion that he himself has become convinced that he has gone astray in his research on this problem. If necessary, the leader orders additional study of this problem, the conducting of tests, checking in exercises, etc.

Under these conditions a work atmosphere is created in the group which inevitably absorbs all its members and draws them into the common work directed to the solution of one common task.

The leader must listen to the points of view expressed by his subordinates with due attention and patience. At times sharp disagreements may arise. They must be openly discussed and analyzed and under these circumstances no abrupt orders must be given. M. I. Dragonirov has said that in science there are no generals or second lieutenants.

The experience in writing group studies has shown that various abnormalities frequently arise in the interrelationship between the team leaders and members.

One of these is that the leader is unavailable. Access to the leader is difficult and therefore it is almost impossible to consult with him on a particular problem during the course of the work and the team member is left on his own.

A second irregularity is excessive supervision, too close leadership. It is well-known that sometimes it is easier for the leader himself to formulate a particular problem than to get the necessary corrections from a writer of a particular part of the study. However, if the leader uses this approach, in the course of a major study, requiring the application of the energies of the entire group over a long period of time such a leader will be ineffective. In addition, this does not lead to a correct development of workers in the field of military science. Each researcher must obtain a proper solution of a problem, even if the assistance of the leader is required.

A third error is that the leadership is not adequately specific and the leader does not have firm points of view concerning the problem being studied or has a superficial knowledge of the problem. When the leadership is of this type a team member fails to receive a clear-cut guidance on the investigated problem and the instructions are usually fuzzy and contradictory.

Naturally, all these and other shortcomings in leadership can have an extremely serious effect on the entire course of development of the corresponding group study.

The attitude toward the group by individual members of the team of researchers can have an equally negative effect on the quality of the group work.

A group study is valuable not only because of the broad scope of the problem with which it deals, but also because of the depth and integration of thought. In a team of authors each researcher conducts himself primarily as a member of a creative team, not as an individual, the author of some section or chapter. The study produced by the team of authors is a common group product in which the intelligence, experience and knowledge of the entire research team are reflected.

Thus, the types of work in military science can be highly varied. Each officer or general engaged in work in the military science field must select those aspects of the field which correspond most closely to the character and content of the problems which are to be solved and also the execution of tasks insuring a further increase in the battle readiness and battle capability of our

armed forces. A clever use of all the forms of military science work will make it possible to use the experience and knowledge of many generals and officers in the army, air force and navy for developing Soviet military science.

4. Types of Military Science Studies.

The results of scientific work, regardless of the form in which it has been conducted, are embodied in various types of scientific studies.

On the basis of purpose and type of exposition military science studies can be divided into the following principal types: abstracts, dissertation work, studies written for award of an academic degree, textbooks and study aids, regulations and instructions, and research studies. Other types of military science writings include articles, reviews, scientific reports and other studies casting a new light on various problems in the theory of military affairs.

A paper (or abstract) on military theory or military history is usually the primary and simplest type of work in military science. A paper is a brief exposition, in written form, of the essence of some subject, doctrine, scientific problem, content of a book, public report, etc.

However, sometimes a paper can be of very great scientific importance.

In work in the field of military science papers are usually written so that officers will acquire basic skills in independent handling and concise exposition of material.

The author of a paper or abstract must select published material on a subject, study it and present its basic content in a definite restricted scope.

In going about the writing of a paper or abstract it is first necessary to clearly define the subject, content in scope of the problems to be dealt with, as well as the sequence for their exposition. It is also necessary to clearly visualize how each problem can be dealt with in detail, what conclusions and principles are to be used as the basis for the paper and what tables, diagrams and figures must be prepared.

A paper or abstract usually consists of three parts: introduction, main exposition of the subject and conclusion or summary. The scope of the paper is dependent on the complexity of the subject and the author's preparation and training.

The author's exposition of the basic points of his own dissertation, with his conclusions and validation of the new points which it presents and what it contributes to science and tactical work, is known as an author's summary or abstract.

An author's abstract or summary requires from the author an ability to present the results of his research in concise form. It also usually indicates the length of the dissertation, the number of diagrams, figures, maps, photographs and other appendices. The length and content of the author's summary or abstract should be such that by reading through it the reader can obtain a full idea concerning the content of the dissertation work. Primary concern should be with having an author's summary of a high quality, with its content corresponding to what the dissertation actually contains. In most cases the length of the author's summary of a Candidate's dissertation on operational -- tactical subjects does not exceed forty pages of typewritten text. The length of an author's summary of a Doctor's dissertation can be greater.

A review must be distinguished from a paper, abstract or summary.

A review is a commentary, a critical evaluation of some published work. First the author usually gives a concise description of the contents of the work, then a general description with his evaluation of the positive and negative aspects, and finally a mandatory general conclusion or evaluation.

The reviewer must properly evaluate the reviewed work, determine its ideological and theoretical level, scientific and informative value, note in exact presentations of subject matter, errors of fact and thought, if they exist, and indicate errors in style and language. Each point made in the review must be substantiated and specific and the general conclusion (evaluation) must be clear and definite.

Diploma work, as one of the types of writing in military science, has as its purpose the checking of the ability of officers graduating from academies to make independent application of theoretical principles in solving definite problems in military art. Diploma work imparts to the student skills in the independent study of a subject, written exposition of his thoughts, and most importantly, develops his operational-tactical reasoning.

Diploma work should be a brief, but finalized study of a subject and correspond precisely to the assigned theme. In formulating a diploma theme,

it must be remembered that any principle set forth by the author must be convincingly substantiated. All the material must be presented rigorously and logically. The most frequent errors made by writers of diploma studies are: jumping from one subject to another, repetition, exposition of material out of place and incorporation of excessive small details in the study. These errors can be avoided if each key subject is worked up carefully and in sequence and if thoughts are formulated as clearly as possible. The greater the amount of original and independent reasoning in the paper, the more valuable is the diploma work.

However, it is not only important to set forth facts and explain them, but also it is important to draw theoretically correct conclusions which are of practical value. However, in diploma studies the authors sometimes draw conclusions and set forth principles taken word for word from textbooks, lectures, regulations and instructions and there is a tendency to make everything conform to official sources. Naturally, such work cannot be given a high evaluation.

A dissertation is a scientific study which is publicly defended in order that the writer can be awarded the academic degree of Candidate or Doctor of Sciences. A dissertation for the award of the academic degree of Candidate of Military Sciences must reveal the overall theoretical knowledge of the writer in the field of tactics and operational art, special knowledge on the subject matter of the dissertation and his capacity for independent scientific research, which must be expressed in the exposition of a new scientific result.

A dissertation for the award of the academic degree of Doctor of Military Sciences must represent independent research work, as a result of which the author gives a solution or a theoretical generalization of problems in military science which are of considerable scientific interest.

Thus, a Candidate's dissertation as one of the types of writings in military science has the purpose of demonstrating the author's capacity for independent research work and producing a new scientific result or finding of the subject studied. A doctoral dissertation is for producing some new and major contribution to military science.

A dissertation cannot be a simple compilation, that is, it cannot be based simply on a number of sources and the compilation of a new study on their basis.

It must represent an independent research by the author. Only research develops a mastery in thought and makes it possible to rise to the height of truly scientific generalizations and attain new results in a particular branch of military knowledge.

Scientific studies devoted to formulation of the basic principles of Marxist-Leninist teaching concerning war and the army, the history of military art, study of the forms and methods of armed combat, the effect of various factors on combat operations of forces, the use of various types of armament, troops and types of armed forces in battle, operations and war as a whole can serve as dissertations for the award of the academic degree of Candidate or Doctor of Military Sciences. Textbooks and study manuals representing the independent military science or scientific and methodological work of the author can be used as dissertations.

A dissertation can be defended at an advanced academic institution or at a scientific research institute which has been granted that right.

A textbook or study aid (manual) is a type of study in military science whose purpose is to present instructional themes provided for in the curriculum in a systematic form.

The requirements imposed on textbooks dealing with military disciplines are determined to a considerable extent by the individual characteristics of each of these disciplines.

A textbook must rigorously conform to the approved instruction program and represent the most complete and integrated exposition of the theoretical principles of a particular discipline. It must be scientific, that is, based on modern attainments in Soviet military science and technology; the theoretical principles in military science considered in such a text must be convincingly substantiated.

A textbook for any branch of military science, as a social science, must serve as an effective tool in training in the spirit of a scientific point of view of the Communist Party, Soviet patriotism and Soviet national and military pride. The latter is achieved by a proper presentation of the matter of priority and the role of Soviet science in the development of the particular discipline.

In each text book the author must clearly and precisely define the subject matter of his science. The exposition of content must have a creative

character. The examination of any aspects of war, military operations and battle includes a study of their relationship and interdependence with other phenomena. In no case must a text book be forced into a definite mold.

Every subject in the text book must be presented in such a way that it will encourage thought and force a student to think about the problems involved in the further development of science in the particular field. In the text book it is very important to point out clearly the direction and prospects for development of any particular work and define the most important problems which must be solved by theory and practical work. At the same time, the exposition must be clear, precise and well-ordered. An effort must also be made that the method for exposition of the course in a text book corresponds to the method for its exposition in lectures.

Each text book or academic manual on operational-tactical disciplines must contain material from the experience of war and military exercises. However, in placing such material in a text book it must always be remembered that a simple collection of facts, even very extensive, is not the entire requirement. In order to master a particular discipline it is necessary to have a profound theoretical base. Therefore, full demonstration, validation and explanation of the discussed problems and principles constitute a highly important characteristic of a text book or study manual.

A text book must be illustrated with examples, figures, diagrams and graphs insuring that the material can be assimilated. A well-devised diagram or graph can replace or considerably reduce the length of a long explanatory text. In the placement of illustrative material an effort must be made that simple figures can be readily drawn by the instructor on a blackboard and more complex figures can be replaced by graphic diagrams or sketches which can be used when presenting the lectures.

In all cases when determining the structure of a text book the authors must be guided by the principle of progressive exposition of the subject, proceeding from the simple to the complex in the instructional material. The structure of the text book must correspond to its length.

The task of writing a fully valuable text book is extremely complex and time consuming. The author must thoroughly know the content of the course, have adequate instructional experience and be a master in the method for presentation

of a course. A single author usually spends many years in the writing of a text book. Earlier written chapters frequently become outdated and lose their logical connection in the exposition. The writing of a text book by a group of authors, as experience has shown, gives considerably better results.

In most cases the same requirements are imposed on the writing of an instructional manual as on a text book. The only difference is that the instructional manual does not cover the entire subject but only some of the problems studied in it. Frequently it is undesirable to include some problems which are included in a text book. In the latter case the instructional manual is a supplement to the text book and does not have independent importance.

Rules and regulations are formed of published work setting forth official points of view and attitudes which must be implemented. Definite requirements are imposed on writings of this type: they must have a scientific basis and unquestionable reliability of content; accuracy, brevity and clarity of exposition; good structure. Every word in the regulations must be sound and carefully brought out.

A research study is a scientific paper or monograph which is based on a profound and thorough study of some problem or phenomenon and which contains the conclusions drawn by the author (authors). If a research study covers all aspects of any single problem on a single basis and with great completeness this study constitutes a monograph. Research studies usually contain extensive scientific data and are accompanied by reference information, a bibliographic index, etc.

It goes without saying that the description of an event (fact) or the selection of official documents on a particular subject cannot be considered research. However, if the description is expanded with such breadth, relying on such documentary (experimental) material and contains such conclusions by the author that it is possible to comprehend the particular subject very fully, such a study undoubtedly has the character of research.

Research studies on military topics usually can be classified into three types: military theory, military history and military engineering.

Studies in military theory cover a wide range of problems in strategy, operational art and tactics. Their content and structure cannot be defined by a standard plan and are entirely dependent on the character of the investigated

problems (phenomena) and the objective which the author (authors) have set. In the writing of a study in military theory the researcher uses as a point of departure primarily the existing material base of armed conflict and the prospects for its development, the experience of past wars and peacetime military experience. In most cases the material for the research is not any single fact from the experience of one battle, operation or single exercise (maneuver) etc., but a series of facts (phenomena) observed in several battles, operations or several exercises (maneuvers), experiments, etc. From among all the facts (phenomena) the authors take only the pertinent data: individual standards, procedures, generalizations, etc., and these data are then regarded from the point of view of a particular scientific problem.

Studies in military history are usually devoted to a thorough study of a battle, operation, campaign, war, military art of some country during a particular historical period or the activity of some military leader.

Studies in military history, devoted to an investigation of operations, must primarily clearly define the importance and place of the operation in the course of a campaign or the entire war and also with sufficient completeness discuss the matters of preparation, planning and conduct of an operation, the use of types of military forces and combat technique, activity of commanders in controlling military forces and the influence of a particular operation on the development of operational art and tactics. Such studies must certainly not be of a descriptive character. Analysis of the facts and events must be organically intertwined with the description. In addition, such a study must have a concluding section giving results and conclusions. This section is developed with particular completeness. The conclusions must clearly answer the question of how study of the experience of this particular operation is instructive and valuable for the development of military art.

Studies in military history devoted to the investigation of individual stages in the development of military art, the activity of a military leader, etc., in addition to a study of specific materials on this problem, should give a proper description of the socioeconomic and political conditions under which a particular event transpired or the military leader performed his functions.

In writing studies in military history an effort must be made that they assist the leader in correctly comprehending the history of the described

campaign (operation, battle), historical heritage left by the oustanding leaders of the Russian Army and the Soviet Army and Fleet to the history of wars and military art.

Studies in military engineering are usually a study of some type of armament and combat equipment.

A theoretical article, as a type of study in military science, is a scientific writing which is limited in scope and content. The article can be published in a military collection of articles, a magazine or military newspaper. Articles on military subjects differ from other types of studies in military science in that they usually have a lesser depth of research than other studies and the content is more concise.

The value of an article is in its timeliness, content, usability in day-to-day work and also in the fact that an article of this nature can be written by any officer or general. However, this does not at all mean that it is easy to write a theoretical article. Much work must be done in order to write a good theoretical article with scientifically sound conclusions and generalizations. Even when the author knows what must be written, a great deal of thought is required before writing: an outline of the article, basic principles, their argumentation and without fail practical conclusions and proposals. N. G. Chernyshevskiy wrote: " . . . think things out clearly . . . and then think some more; then certain things will not be written but what has been written will contain nothing that has not been thought out thoroughly . . ." [5].

In selecting the form of exposition particular care must be given to the need for the most expressive presentation of the basic material and clear presentation of the main points.

A report at a scientific conference (meeting, scientific gathering) is also one of the types of studies in military science.

The writing of a report requires much careful work. M. I. Kalinin stated: "A writing of a report requires that every word and every thought be thoroughly thought out. In writing a report it is necessary to look back and forth in the sources." [6].

A report should be based only on fundamental ideas to whose demonstration the author must devote the greater part of his time, in other words, the report

must not consist of individual fragmentary points, but its entire presentation must have internal coherence and be subordinate to the fundamental ideas set forth. The demonstrations must be presented in such a system that the entire report is characterized by soundness and is convincing. At the same time, in a scientific report which is to be open for discussion problems must be raised for discussion. Particular attention should be drawn to these problems and the author should express his thoughts concerning them, as well as contradictory opinions.

Simultaneously with the writing of the report text the author prepares graphic aids in the form of models, diagrams, maps and tables. An effort must be made not to burden the report with a great amount of illustrative material, using only such material as is actually necessary.

All types of studies in military science must be presented in a rigorously scientific and popular form or solely in a rigorously scientific form. For example, research studies, dissertations and diploma papers are presented in a rigorously scientific form. Articles, text books, instructional manuals and reports must be presented in both a rigorously scientific form and in a popular form. The form of exposition is determined most frequently by the intended use of the particular study in military science. If the study is intended only for instruction of the reader in a particular field it must be written in a strictly scientific form. However, if the study is intended for a broad range of readers it naturally must be written in popular form.

5. Basic Principles of Research in Military Science

Research in military science is characterized by the same principles as in any other scientific research in the field of social life.

The basic guiding principle in military science research is the Communist Party principle. This can be attributed to the fact that in a class society the relationships among peoples have a class nature.

V. I. Lenin, in emphasizing the objective inevitability of adherence to the Party spirit principle, pointed out: "It is impossible to live in society and be free from society" [7]. However, in society rent by an uncompromising class struggle " . . . not a single living person can stand aside from another (once he has understood their interrelationship), cannot but rejoice at the success

of a particular class, cannot but be unhappy at its failures, cannot but be indignant at those who are hostile to this class and those who hinder its development by the dissemination of backward points of view, etc., etc.," [8].

The Bourgeoisie, constituting an insignificant minority of society, suppresses the depressed classes only by means of force, defeat and hypocrisy. In order to conceal their true face, the Bourgeoisie parades its interests as being in the general interest of mankind and contends that the class organization of the state is a social organization of control.

The party spirit of the Bourgeoisie therefore parades under the mask of objectivism, which is the class lie and hypocrisy of the Bourgeoisie and its apprentice lackeys. Lenin wrote: "The lack of party spirit in Bourgeois society is only a hypocritical, mock and passive expression of belonging to the party of the sated, the party of the ruling class, the party of exploiters.

Lack of party spirit is the idea of the Bourgeoisie. Party spirit is a socialist idea" [9].

The class, party struggle is not only conducted in the political and ideological field. It embraces all aspects of life of modern society separated into two opposite camps: the progressive socialistic and the reactionary imperialistic camps. This also determines the open form of proletarian party spirit, its militant, vigorous character and scientific, truthful sense.

The principle of Communist party spirit requires an approach to the study and evaluation of various events from the principles of Marxism-Leninism, resolutely conducting the struggle against Bourgeois idealist and metaphysical methodology, a struggle for the purity of the Marxist-Leninist philosophy.

International reaction, striving to attack the ideas of Communism, makes use of the vilest methods of ideological diversion against the countries of the socialistic camp. Accordingly, it is necessary to have a high revolutionary vigilance and an intensification of Communist party spirit in all sectors of ideological work, including in the field of military science. The military researcher cannot pass over falsification of military history and other facts by scientific lackeys of the bourgeosie. The clear duty of workers in military science, like all Soviet scientists is to smash the enemies who are unrelenting

against their ideas, and resolutely and with sound arguments unmask them, demonstrate and propagandize the achievements of our Soviet science and technology.

At the same time, the Communist Party clearly defines the approach of Soviet researchers, including military researchers, to the Bourgeois science and the representatives of the science. Bourgeois science is capable of producing valuable studies in special fields of knowledge. Therefore, the problem is to attentively watch their achievements and take into account everything which is of value in the further development and perfection of military science and the technical means of combat. At the same time it is necessary " . . . to be able to read over their reactionary tendency, be able to follow one's line and reject all lines of forces and classes hostile to us" [10].

Adherence to the principles of Communist party spirit in military science means to be impeccable against any manifestations of Bourgeois ideology, directly and openly defend the interest of the proletariat as the leading and most progressive social class and conscientiously and actively serve the great objective of protecting the socialist Fatherland by military science research. Since the preparation of our national defense is guided by the Communist Party, the highly important requirement of the principle of Communist party spirit in military science is to be guided by the instructions of the Communist Party in all military science activity.

The Marxist principle of party spirit is a theory hostile to any apolitical attitudes, passive contemplation of reality and indifference to the class interest of the proletariat.

Communist party spirit requires that an implacable struggle be conducted against Bourgeois objectivism, without concealing, but instead laying bare the contradictions between the old and the new, between the progressive and the reactionary; it makes obligatory a direct and open stand on the side of the new, the progressive, and against the old and outworn. Only such a position expresses the objective law of development because the future always belongs to the new, the progressive, the developing.

Marxism-Leninism is implacable in struggling against subjectivism, against arbitrariness in the evaluation of phenomena and against any attempts

to represent the present or the past in improved or in worsened form to the advantage of any preconceived point of view. V. I. Lenin scourged those who substituted subjective concoctions for objective analysis. He warned against quoting individual facts in playing games with examples, he taught that facts should be considered in context, with their real meaning in the whole picture. In resolutely rejecting subjectivism in the study of social prefaces, V. I. Lenin wrote: "It is not a matter of who 'considers' something to be true, what is 'interesting' to someone, that what actually is the case independently of the human awareness" [11].

Party spirit in scientific research is a higher form of expression of a truly scientific approach to the phenomena of reality. Lenin regarded Marx's "Das Kapital" as a model of militant party spirit in scientific research. In "Das Kapital", Lenin pointed out, there is a compination of inexorable objectivity in the study of social phenomena with heated and passionate polemics against the representatives of backward points of view, against the representatives of those classes who hinder social development. Profound militant party spirit permeated all the studies of V. I. Lenin.

Party spirit in military science is formulating all theory on the basis of the most careful, thorough allowance for the objective laws and requirements of further development of military science, the requirements of the Soviet Armed Forces, whose mission includes insuring the safety of our Soviet State. This is possible only on the basis of a bold application of the Marxist dialectic method, a profound study and analysis of past military experience, present-day means of combat and practical activity of armies, that is, the entire military and political preparation of Soviet soldiers.

Each scientific study in the field of military art must impart to military personnel new discoveries, facilitate the most effective use of available forces and equipment, and also serve to educate the personnel in our army and navy. Therefore, each study in the field of military science must be written on a thoroughly scientific basis and prepared on a high ideological and theoretical level.

The party spirit principle must be adhered to in every study in the field of military science. The more rigorously and thoroughly this principle is adhered to, the more fully will the study correspond to the requirements of the Soviet Armed Forces.

Communist party spirit is inseparable from true scientific objectivity in research. They are inseparably related to one another. For example, it is impossible to discuss the experience of war scientifically without giving a true objective evaluation of events. However, there are some researchers who strive to embellish and idealize many phenomena in war and do not to an adequate degree show the difficulties and they are silent and minimize our errors and shortcomings. Scientific objectivity is necessary not only in a study and evaluation of the experience of the past, but also of the present time. In a study of the experience of military exercises and maneuvers, the possibilities of military equipment and armament, methods for operations of armies, etc., the military researcher must be objective and dispassionate; it is necessary to take notice of both the positive and the negative. The facts never can be forced to fit a previously formulated hypothesis. On the contrary, those facts which contradict a hypothesis advanced earlier by the author must be carefully analyzed.

A total objectivity of a study can be attained only on the basis of an exclusively scientific, Marxist-Leninist understanding of the laws of social life in general and the laws of development of military affairs in particular. Therefore, the Marxist-Leninist philosophy is the dcientific basis for a Communist party spirit.

The struggle for a Marxist-Leninist philosophy against reactionary Bourgeois policy and ideology does not simply require a declaration of the necessity for adhering to the party spirit principle, but the real ability to adhere to this principle in actuality in the course of work in the field of military science.

From this fundamental, key principle, the Communist party spirit principle also follows such a principle for scientific research as the need for a bold formulation and creative solution of the most timely scientific problems. Science requires boldness, a resolute breaking of old traditions, standards and rules and the blazing of new trails. The fear to say something new or say it differently than it has been said by some other authority and the restating of long -- known truths leads to walking on a treadmill, makes studies superficial and is of no value in scientific respects.

Stalin stated: "Science in the course of its development has known more than a few brave individuals who had the ability to break with the old and

create something new, despite whatever obstacles were in their path and despite everyone. Such men of science as Galileo, Darwin and many others are well known. I would like to discuss one of these leading figures of science, who at the same time is an outstanding individual of modern times. I have in mind Lenin, our teacher, our educator. Remember 1917. On the basis of a scientific analysis of the social development of Russia and on the basis of a scientific analysis of the international situation, Lenin then concluded that the only way out of the situation was the victory of socialism in Russia. This was more than an unexpected conclusion for many men of science at that time. Plekhanov, one of the outstanding men of science, spoke at that time with scorn of Lenin, asserting that Lenin was "raving mad". Other not less known men of science asserted that "Lenin has gone out of his head and that he would have to be put away soon". At that time there were all kinds of men of science who were against Lenin as against a man who was violating science. However, Lenin did not fear to go against the current, against the grain, and Lenin was victorious.

Here you have a model of a man of science, boldly conducting a struggle against antiquated science and blazing the trail for new science [12].

In military science this principle assumes particular importance.

Continuous scientific and technical progress and rapid devleopment of means of combat require that men of science consider new and serious problems, draw essentially new conclusions and resolutely reject old, outdated solutions of various problems. All this must be based on a profound knowledge of the investigated problem and a careful analysis of all the conditions underlying the appearance and development of the studied phenomenon.

Military theory must illuminate the path for practical workers and those with inventive minds. The solution of practical problems in the field of preparing armed forces and their use is dependent on how correctly and profoundly various problems in military theory are developed.

Demonstrability is an important principle of scientific research. Any study is unthinkable without proofs of the positions advanced by the authors. A study in which only naked "truths" are presented and nothing is proved is not a research work. Each point must be convincingly demonstrated by facts or a rigorous system of logical reasoning. The strength of a research study is in the nature of the proofs, not in the personal assertions of the author.

The most convincing proof is demonstration by facts. I. P. Pavlov wrote: "Learn to do manuscript work in science. Study, compare and accumulate facts.

However perfect the wing of a bird, it could never carry the bird aloft without resting on the air. Facts are the scientist's air. Without facts you can never fly. Without them your 'theories' are vain efforts.

However, by studying, experimenting and observing you strive to delve beneath the surface of the facts. Do not transform yourself into an archivist of facts. Strive to penetrate into the secret of their genesis. Stubbornly seek the laws which control them" [13].

However, one must know how to collect facts and sort them with all possible completeness and rigor. V. I. Lenin wrote: "Precise facts, indisputable facts, this is what is particularly . . . necessary if you seriously wish to analyze a complex and difficult problem . . . but how to collect facts? How to establish their relationship and interrelationship?

In the field of social phenomena there is no procedure more common or more invalid than reference to <u>individual</u> facts, a game of citing examples. In general, there is no difficulty in selecting examples, but this is without any importance or is of purely negative significance, because everything in historical specific circumstances consists of individual cases. Facts, if they are taken <u>as a whole</u>, in interrelation to one another, constitute not only a 'stubborn', but also unquestionable demonstration of a point. Facts, if they are taken out of context, without regard for their interrelationship, if they are fragmentary or random, constitute only a toy or something still worse" [14].

V. I. Lenin taught that in the study of any phenomenon " . . . an attempt must be made to establish such a foundation and precise and indisputable facts on which one can rely and with which one can compare any of the 'general' or model reasonings . . . In order that this actually be a foundation, it is necessary to reject the use of individual facts, and instead use the <u>totality</u> of facts relating to the particular problem, <u>without any</u> exception, because otherwise the suspicion will inevitably arise, and quite rightly so, that the facts were selected arbitrarily or purposely, so that instead of an objective relationship and intercausality of historical phenomena as a whole, there will be a 'subjective' concoction for the justification of what may be a pretty rotten affair. This happens . . . more frequently than one would think" [15].

The truth of scientific conclusions is checked by practical work. "To be or not to be" of any scientific position is solved in the last analysis not by private opinion, but on the basis of a solidly grounded scientific demonstration, practical experience, being the test of the truth. However, this does not mean that every position in military science can be subjected at any time to direct testing by practical experience, such opportunities may arise only during time, and war is not a continuous state of society. Therefore, in the periods between wars an effort must be made to investigate with profound thoroughness whether a theory formulated during peacetime corresponds as much as possible to the nature of a future war or whether it has experienced serious changes.

In order to achieve this goal it is necessary to be guided rigorously by the methods of dialectic materialism.

The Marxist dialectic method, correctly reflecting the objective laws of the material world, is for all sciences, including military science, a reliable tool for learning the truth. Therefore, the study of the phenomena of war and military matters must be made in full accordance with the laws of materialistic dialectics, relying on these laws and using them as a point of departure.

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Chapter II

APPLICATION OF THE MARXIST DIALECTIC METHOD IN MILITARY SCIENCE RESEARCH

1. Relationship and Intercausality of Military Phenomena

As is well known, nature and society constitute an integral whole in which the objects and phenomena are dependent on one another and are causally interrelated. A requirement of the dialectic method follows from this objective law, that is, it is necessary to examine any object or any phenomenon not in isolation, but in its inseparable relationship to surrounding phenomena and objects, taking into account their causal interrelationship.

Marxism-Leninism requires that every phenomenon be examined in broad and integral relationship to other phenomena; a part of a phenomenon must be examined in dependence on the whole and the whole must be regarded in its interrelationship to all its components and in dependence on surrounding reality. Lenin emphasized this point in dialectic thought. He stated that the spirit of the dialectic method is in specific analysis.

In application to the phenomena of social life this law of dialectics is expressed in the requirement of a specific and historical approach.

Marxism-Leninism penetrates the historical method which supposed a truthful study and interpretation of historical facts, phenomena and events in their internal legitimate interrelationship and clarification of their meaning and class content. The materialistic dialectics method requires that any phenomenon of social life be analyzed in the specific historical circumstances generating it and that it not be regarded in isolation but in all its interrelationships and dependences. Without a specific and historical approach there can be no science of society and therefore military science as well would be impossible.

War is not an isolated phenomena. It is closely related to specific and historical conditions and is generated by them. At the same time it is itself an integral whole in relationship to its component parts (campaigns, operations, battles) and represents a complex and contradictory process in which a multitude of facts, phenomena and events are interrelated with one another and affect one another, affect the course of the entire war and themselves are

dependent on the course of this war. Naturally, in such a complex process every phenomenon can be understood only in the context of its direct and indirect relationships. For example, it is impossible to determine why during a particular battle some units employed certain combat formations whereas other units used different ones unless we examined the missions assigned to each of these units and the specific combat circumstances under which these missions were performed.

Military phenomena, considered individually, appear to be rather random, but if a number of very similar phenomena are compared and they are examined together, it is always possible to note a definite pattern, a definite order with respect to their nature.

Dialectic materialism teaches us to view life as it actually is. V. I. Lenin emphasized that "the Marxist method, more than anything else, involves taking into account the objective content of a historical process at a particular and specific time, under specific conditions . . . " [1].

History cannot be made better than it is or worse than it is. However, in a number of works which have been published in our country in the years since the war the authors have allowed themselves to present a one-sided exposition of the experience of the last war without properly discussing its difficulties, playing down the errors which we committed and the shortcomings of the initial period of the war which were most difficult for us. Whereas in reality our forces, while displaying great patriotism, courage and tenacity, were forced during the initial period of the war to conduct severe battles and operations while retreating, in a number of books and studies this period has been represented as a preplanned active defense, a "classical form" of active defense. In this way the authors have distorted the true course of military events. They have violated one of the fundamental requirements in dialectic materialism, obligating us to see life as it actually is, soberly taking into account all the most important aspects of the investigated phenomena and clarifying what is most important in them. It has been for this violation that such studies have been subjected to severe and thorough criticism by our press.

The mutual relationship and reciprocal intercausality of wartime events indicate that these phenomena conform to definite laws.

A law is a necessary, important, stable and persistent interrelationship and intercausality of phenomena prevailing under definite conditions. For example, one of the laws of military science discovered and formulated by Engel's expresses the relationship between the methods for conducting war and the development of production [2].

Nonessential relationships introduce some shading into the operation of the law without modifying its essence, but at the same time frequently obscuring the latter.

The important and necessary nature of the relationships represented by the law imparts to it a mandatory and compulsory character which is expressed in the requirements of the law. The latter are in no way whatsoever subjective. They mean that a particular phenomenon can exist and develop only in the relationship which was predetermined by the law. For example, the growth of the massiveness, mobility and striking force of armies is an unconditional law of development of military art [3], but this growth can come about only if there is a development of production with its transition to higher levels.

The laws of nature and society, including the laws of war, are objective and exist independently of the will and consciousness of people. People can discover them, learn them, teach them and use them in their practical activity, but they are absolutely incapable of changing or substituting these laws and the activities of people contradicting such laws is doomed to failure. However, there are very great differences between the laws of nature and the laws of society. One of them is associated with the law which the activity of people plays in the manifestation of various laws. This activity is not among the mandatory conditions for the manifestation of the laws of nature. However, the laws of society exist only on the basis of those conditions which are created by the activity of people.

The laws of war, as a social and historical phenomenon, also are dependent on such conditions to an equal degree. The operation of these laws is reflected in the form of human activity.

One of the distinguishing characteristics of any law is its universality, characterizing the scope of the phenomenological medium in which the particular law operates. In the field of military phenomena one can define the most general laws operating in wars of all kinds among all peoples, general laws of

class revolutionary wars, specific laws of wars during a specific historical epoch and each particular war, campaign, operation and battle. All the more general laws of war and military phenomena, as well as the general laws of development of society, have a historical character, that is, they operate differently under different specific historical conditions.

The laws of each particular field of phenomena and all the more general laws also applying to this field interact on one another and are in constant interaction. The effect of an individual law can be examined only in the course of an analysis. However, in actuality there is always a system of interacting laws. The interrelationship of laws can intensify the effect of each of them. At the same time, the effect of a single law (or several laws) can interfere with another law and narrow the sphere of its operation.

The concept of the interrelationship and interaction of laws is exceptionally important for practical activity. It means that one cannot be guided by some objective laws and ignore others. The interrelationship of objective laws must be taken into account in practical activity.

The history of science and technology is a history of learning of natural laws. The beginning of revelation of any law is a sound knowledge (familiarization with facts and phenomena). Abstract thought generalizes these sound data in the form of a scientific supposition or hypothesis. Practical investigation must be applied to check whether the hypothesis corresponds to the facts. A scientific hypothesis which has been checked and confirmed by practical experimentation then enters into science as a theory, the basis of which is newly discovered laws.

The development of knowledge and the revelation of scientific laws proceeds from the particular to the general and most general laws, and also from general laws to particular laws. For example, the creation of materialistic dialectics as the science of the most general laws of development of the universe was prepared, as pointed out by F. Engel's, by three great discoveries in natural science in the nineteenth century (the cell theory, the law of conservation and transformation of energy and Darwin's theory). At the same time, a knowledge of general laws becomes a point of departure for the discovery of new special laws.

The discovery of laws is not the end purpose of science. Its supreme mission is to be of service in practical activity and be of assistance in the executing of practical activity at a higher level. "The laws of the external world of nature . . . are the basis of the feasible activity of man" [4]. To be sure, it is no simple matter to conform to the requirements of a specific historical approach, to find interrelationships, interdependences and intercausalities, to discover and recognize the laws of examined phenomena. This requires primarily that one detect the essence of the investigated phenomena; as is well known this does not coincide with the external appearance of the phenomenon. In actuality, the very essence of a scientific study is the revelation of the true nature of things beyond the external form of their manifestation. K. Marx pointed out that if the form of manifestation and the true substance of things coincided all science would be superfluous. "Every problem must be approached from the point of view of its true nature; external manifestations are regarded only as signposts indicating the path to the threshold by whose crossing we finally reach to the essence of the problem. This is the only reliable scientific method for analysis of phenomena" [5].

Thoroughness of scientific research in the Leninist understanding requires such an allowance for the totality of studied facts which will afford the possibility for interpreting them from the point of view of the most important and most decisive aspects of their content, from the point of view of the primary tendency in their development. "The most reliable course to take in the problem of social science and the most necessary condition in order to really acquire the habit of properly approaching this problem and not permitting oneself to be lost in a mass of details or in an enormous variety of conflicting opinions, the most important consideration making it possible to approach this problem from a scientific point of view, is not to forget the basic historical relationship, to look at each problem from the point of view of how a certain phenomenon developed in history, what fundamental stages the phenomenon passed through in its development, and from this point of view consider its development and what this particular phenomenon has now become" [6].

Thus, thoroughness in research involves a consideration of military reality in all its varied forms and in all its contradictions in order to not pass by anything which is revealed by observation, in experimentation or is revealed by historical facts. Thoroughness in research requires a thoughtful attitude

toward surrounding phenomenon, the ability to observe them and note characteristic features affording the possibility for drawing definite conclusions.

Only as a result of the abstracting activity of the human mind in the course of analysis of the totality of highly varied and many times random phenomenon is it possible to select from them the general, identical and primary characteristics and criteria; only in this way is it possible to shove aside from the others those aspects and criteria which are of secondary importance and thus get to the heart of the matter. The dialectic process of specific analysis in the ordinary activity of a commander has been defined very clearly by Mao Tse-tung.

"The proper grouping of forces for a battle", he writes, "follows from the proper decision by the commander; the correct decision follows from a correct evaluation of the circumstances and a correct evaluation of circumstances is based on necessary and thorough reconnaissance and on careful study and generalization of all its data. The commander uses all possible and necessary means for reconnaissance in order to obtain data on the enemy; he studies the data collected in reconnaissance, sifting the chaff and collecting the grains, separating out the spurious and retaining the true, progressing from the particular to the general, from the external to the internal. Then the commander compares these data with his own circumstances, studies the relationship of the forces of both sides and their interrelationshp, and then he makes an evaluation, makes a decision and forms a plan. This is an integral cognitive process directed to a study of the circumstances by a military leader before he proceeds to prepare a strategic, operational or tactical plan" [7].

Naturally, in military science research as well it is necessary to be indisputable in specific analysis. The researcher is obliged to bare all the relationships, reciprocal influences and indirect influences not only applicable to any particular aspect, but to examine the entire investigated problem in its dynamics, in the light of the prospects for changes which will occur as the result of operations of his armies, the counteractions of the enemy and the influence of other factors. Such an investigation is particularly important now, when the use of new combat methods results in rapid and sharp reciprocal effects which radically change earlier circumstances. This undoubtedly is creating particularly great difficulties for the process of research in military science which even before was no easy matter.

In the phenomena of battle and military operations it was always difficult to lay ones finger on the heart of the action. This can be seen by citing an example. One military researcher, in examining the example of a specific operation in which a base of operations was captured by forces making a crossing by improvised means, demonstrated that these forces held the captured base of operations for a period of three days and thereby insured that standard stream crossing means were concentrated in this sector, thereby further insuring the erection of a crossing and the crossing of the main forces of military units, including artillery and tanks. Proceeding on this basis, and taking into account that in a number of other operations the opposite bank was also taken by troops who had forced a river crossing with whatever means were at hand, this researcher concluded that in the future emergency stream crossing means can play a major role in the forcing of river crossings.

In the discussion of this study its author pointed out that the conclusion mentioned above does not correspond to reality and that it is very clear that the essence of the phenomenon in this case was not discovered. The researcher saw in the overall chain of events only a single fact, one phenomenon, and for this reason he could not correctly understand it. Penetration deeply into the question would have led the researcher to conclusions that were more all-embracing and opposite. These conclusions should include at least the following.

1. Troops having high morale, inspired with the spirit of attack, cannot be content with a halt in the attack, particularly if this halt was caused not so much by enemy resistance, as by natural obstacles. Under these conditions troops seek and in most cases find at least some palliative method for overcoming obstacles.

2. By using whatever river crossing means are available it is only possible to "seize a foothold" on the opposite bank; it is impossible to broaden the foothold to the required size, much less concentrate the forces and equipment capable of expanding the attack on the opposite bank.

3. In order to bring about an unrelenting attack with the overcoming of water barriers it is necessary that an adequate amount of standard crossing river equipment of the necessary quality be delivered to the river bank simultaneously with the arrival of the attacking armies at the river.

4. The use of exclusively river crossing means of an emergency type in any operation indicates, on the one hand, a high spirit of aggressiveness and initiative of the troops, but on the other hand indicates great miscalculations in organizing the attack operation and in directing.

Thus, the ability to expose the actual nature of a phenomenon is an exceptionally important quality of the researcher. However, this alone still does not determine the ability to make the revealed nature of the phenomenon useful for those engaged in practical activity in the future. For example, prior to the First World War the French military theoretician Langle, in his treatise <u>Lessons of the Last Two Wars</u>, very clearly revealed the essence of the new phenomena. On the basis of an analysis of the Boar and Russo-Japanese Wars he pointed out that the progressive improvement in fire power of weapons increases the difficulty of a frontal attack and gives a greater value to light field shelters. However, this French author did not have the dialectic ability to apply the essence of this revealed phenomenon to the specific practical needs in a future war. He could not visualize the mass armies of the future, capable of creating a continuous battle front "from sea to sea". Accordingly, he found that in the future it was necessary only to envelop and strike around the enemy flanks. He did not discover the tendencies to position warfare, and therefore, like other military theoreticians of the time, he could not investigate the material principles of a future war and on this basis glance into the future; as a result, his theoretical conclusions were of no practical importance. This task could be within the capabilities only of a researcher applying the dialectic method, which is not limited solely to the revelation of the essence of phenomena.

After the essence has been determined, the task of scientific cognition is to demonstrate how and why the essence is manifested specifically in such and such a form, and not in some other form, and thus understand more thoroughly the dialectics of the essence and phenomena, their unity in contradiction. The process of scientific cognition is not completed by the revelation of a contradiction between the essence and the phenomenon. "Human thought", pointed V. I. Lenin, "is endlessly deepened from the phenomenon to the essence, from what one might call first-order essence to second-order essence, etc., <u>without end</u>" [8].

It would be impossible to better express here the idea of the interaction between theory and practice. Marxist dialectics regards practicality as the key side of this interaction. Practical experience is the source, the moving force of development of knowledge. It places before science more and more new goals and requires a more and more thorough penetration into the essence of phenomena. The researcher, including the military researcher, must not limit himself to a simple statement, a description of facts, phenomena and events, must not regard them as an unconnected random jumble. He must find interrelationships and reciprocal effects, using as a point of departure the principle of continuity of development; in accordance with this principle he must arrange phenomena in a series and find the law governing this series, that is, he must learn how the examined phenomena correspond to a law. In the cognition process it is not admissible to remain at the surface of the phenomenon; it is essential to get to the heart of the matter, to penetrate into the depth of processes and thoroughly comprehend the laws of development of war and military art.

The arrangement of phenomena and events into a series of continuous development, the interrelationship and intercausality of events are related very intimately to the categories of cause and effect.

Any phenomenon, however insignificant it may seem, has its own natural causes, that is it is generated by other phenomena and causes definite effects, that is it serves as a source of other phenomena. For example, riflemen in extended firing positions was a result of withering rifle fire. However, this character of the latter was itself the result of the development of infantry arms.

The cause and effect relationship has a necessary character, that is, with the repetition of the same causes under identical conditions there will be identical results. For example, in the Franco-Prussian War of 1870-1871 a company column in any case whenever it encountered withering fire from infantry weapons spontaneously spread out into an extended firing position, despite the fact that the commanders thought against this "disorderliness".

The recognition of the cause and effect relationship of effects of all phenomena in reality without exception is a highly important requirement on any truly scientific study. In military science as well, only the application of this requirement will make it possible to foresee the nature of a future war,

its battles and operations. An analysis of past experience, present-day forces and means for armed combat and socioeconomic and political conditions will make it possible to determine, at least in the most general form, the factors capable of causing those effects which will characterize in important characteristics the entire nature of a future war, its operations and battles.

The determination of the cause and the result generated by it is no easy matter. The difficulty consists precisely in the dialectic nature of the operation of the cause and effect relationship. If the cause of any phenomenon has been discovered, this by no means gives basis for asserting that a particular phenomenon necessarily arises from this particular cause. Everything depends on conditions, the place and the time. The same factor, under different conditions, can give rise to completely different results. Vice versa, the same phenomenon can arise from different factors under different conditions.

This has been very convincingly demonstrated, for example, by F. Engels in his article entitled "The Chances of War" [9]. Engels points out that France, having lost its professional army was forced to transform the country into an "armed nation" and not only was not weakened as a result in military respects, but was considerably strengthened, and this forced Prussia to increase the strength of its army and transform itself as a result into an "armed nation" itself. However, since Prussia, after the penetration of its armies into the heart of France became completely aggressive, and as a result of this alien in its political goals to the national masses, this exerted a strong negative effect on the combat readiness of the Prussian army.

The more massive the Prussian army became because of the extended nature of the war, the less it was suited for conquest. One and the same factor, transforming both countries into "armed nations", strengthened the hand of the French and weakened the strength of the Germans.

An extraordinarily important manifestation of the universal dialectic interrelationship is interaction, that is, the joint effect of many factors in a single process. For example, as experience has shown, the rates of attack are dependent on the joint effect of a whole series of factors. However, among them not all exert an identical effect on the result. There are primary (determining, decisive) and nonprimary (auxiliary, secondary) causes of a phenomenon. For example, the principal factors for high or low rates of attack are usually

the degree of breaking of the enemy defense and the interaction between fire power and movement during the course of an attack. Among the nonprimary factors are the character of the terrain, climatic and meteorological conditions, season of the year and time of day. However, if the troops attack under terrain conditions to which they are not accustomed, along muddy and nearly impassable roads, without proper preparedness for attack or at nighttime under difficult climatic conditions, one of the above-mentioned nonprimary factors can lead to consequences which upset all preliminary calculations.

The rigorous definition of primary and nonprimary factors and allowance for their objective in equality are essential conditions for the proper understanding of the nature of military phenomena, for discriminating the necessary cause and effect relationship and for establishing the pattern of their development.

In military, like in other social phenomena, it is also necessary to discriminate objective and subjective factors and determine their interaction, determine whether they operate in the direction of progressive development or counteract it.

A highly important manifestation of the cause and effect relationship is the inverse effect of the result on the factor responsible for it, the interaction of the cause and the effect in each individual cause and effect relationship. For example, it is known that policy exerts an effect on war, but a war which has begun in turn effects policy, becomes the cause of changes in policy. The same thing is also observed in the military engineering field. For example, the use of extended firing positions arose as a result of an intensification in infantry fire power. However, once appearing, it immediately began to exert an influence on the factor which gave rise to it. The fire, being withering for a company column, was inadequate for combat against an extended firing position. It was necessary to intensify the fire radically; the need for a machine gun was born.

The categories of cause and effect, revealing the origin of specific phenomena, represent a highly important theoretical tool in practical and scientific activity. Without establishing causal relationships it is impossible to explain and foresee phenomena. Moreover, the principle of the dialectic-materialistic theory of the great variety, inequality and interaction of different factors is a highly important tool in the hands of people for understanding the interaction

of cause and effect relationships, necessary for solving intended specific missions in military science research.

A scientific knowledge of military phenomena begins with a study of specific facts and determining the cause and effect relationships between them. Determination and then comparison, collation of cause and effect relationships and discrimination of mass, stable, repeating and necessary cause and effect relationships is a highly important stage in military science research.

The phenomena of war and military art cannot be understood without examining them in all their multisided aspects, without clarifying the important, the necessary and the random, without adhering to the principles of cause and effect relationship and without understanding the patterns of development.

Thoroughness and a multisided approach must be an indispensable characteristic of research in military science. Only with a thorough study of a problem is it possible to reveal all the relationships and dependences of a particular phenomenen. Classical examples of thorough investigations are given us by Marx, Engels and Lenin. Their studies always touched on all aspects of the life of society and even at first glance they never lost from view apparently insignifcant phenomena.

History knows of more than a few examples when as a result of a one-sided investigation scientists extended enormous effort and yet did not attain the desired results. In science one must not neglect any problems relating to the investigated subject.

In many cases, it would seem, an insignificant detail which was neglected by one scientist became an important basis for a major discovery in the hands of another scientist.

It is particularly important to give heed to this circumstance when conducting research in military science, where in many cases initially insignificant changes in the methods for conducting combat and operations may be the basis for determining important moments of crisis characterizing the birth of the new and the dying out of the old.

In an analysis of any military phenomenon it is important to determine why this phenomenon arose, how it developed and what exerted an influence on this development. In a study of the phenomena of war it is necessary to reveal the

objective conditions deeply and thoroughly. Mao Tse-tung writes: "It is clear to everyone that regardless of what business we are engaged in if we do not understand its conditions, its nature and its relationship to other phenomena, we will not understand the laws governing this business and we will not know how to proceed with it and we will not be able to execute it" [10].

War is a social phenomenon which at the same time has its special characteristics governed by the peculiarities of armed combat. For this reason military science, relying on the attainments of Marxist-Leninist social science, must be concerned with research on war as a phenomenon in the life of society, on one hand, and on the other hand it must be concerned with the forces, the means and methods for conducting armed combat. However, in actuality the activity in the field of military theory both in Russia in pre-Soviet times, as well as abroad, was concentrated, as indeed it still is concentrated in bourgeois countries, primarily on the study of problems of the second of the mentioned fields, that is on military technical problems, on the development of the theory of military art without regard to sociology.

The reading of the classics of Marxism-Leninism reveals that a one-sided approach to analysis of the phenomena of war is invalid. More than once the classical records have shown that for detecting the truth it is necessary that any military phenomenon be evaluated from the theoretical and political points of view as well as a purely military approach. Examples of a thorough analysis are given, for example, in the military writings of F. Engels. For example, in analyzing the Franco-Prussian War, he approached the problem so thoroughly that even in his first communication, when the warring parties had scarcely exchanged a few shots, he concluded that the first period of the war had already actually been lost by France and in this connection he defined the basic features of strategy and tactics of the French and Prussian armies in the immediate future.

This clarity of foresight was the result of a study of all the phenomena of this war in their interrelationship and intercausality with political, social and military-technical factors. In the writings of Engels the elements of a whole do not exist independently. They became essentially integral components of a unified process.

Later on he traced the stages in the breakdown of the French army which he had predicted, even up to its final catastrophe, which he also foresaw, because

he noted that the contradictions in the regime of the Second Empire were such that they did not allow the French army to attack or to provide a defense. The army could only capitulate. In extremely concise and meaningful paragraphs Engles has given here the only true explanation of the first period of the Franco-Prussian War, which ended at Sedan.

Equally remarkable was the analysis of the second period during this war, presented by Engels. Whereas in a purely military analysis appeared as a total defeat for France, Engels, in examining the problem from all sides, established the turning point of the war and a turning which was in favor of downtrodden France.

This methodological approach used by Engels is extraordinarily instructive He points out that not one fact, not one phenomenon and not one event can be examined in isolation from the overall picture. Neither a single battle nor a single defeat is of importance if they are not related to the overall course of the war, provided their successes do not directly or indirectly influence the attainment of successes in general. In other words, as in military practice it is impossible to understand one's mission without understanding the missions assigned to the higher command, without knowing that the execution of his mission is in the interest of the higher command, so also in research one cannot correctly determine the characteristics of a battle in a future war without understanding the characteristic features of operations in such a war. In examining this problem in application to the everyday activity of commanders, Comrade Mao Tse-tung writes: "Why is it necessary to some degree that commanders also understand the laws of strategy for operational and tactical leadership? Well, it is because by understanding the whole one will properly perform in the particular, because the particular is subordinate to the whole" [11].

The basic conclusion for every researcher, following from an examination of the problem of the mutual relationship and intercausality of phenomena, was formulated with the greatest clarity in the following words of V. I. Lenin: "In order to actually know a subject it is necessary to encompass and study all its aspects, all the relationships involved, both direct and indirect. We never will fully achieve this, but the requirement for thoroughness and a multi-sided approach will safeguard us against errors and falsification" [12].

2. Examination of the Phenomena of War and Military Art in Continuous Development and Change

Marxist dialectics is the most profound and multisided science of development. In contrast to metaphysical concepts concerning the universe as a combination of invariable objects, the Marxist dialectic method considers nature and society in a state of constant self-movement, self-renewal and change, where something is always arising and developing and something is being destroyed and is outliving its time.

The withering away of the old and the birth of the new is an objective law of the development of nature, human society and thought. Everything is in movement and change, so we are taught by dialectics.

This law of dialectics is inseparable from the law of universal interrelationship. Accordingly, the dialectic method requires that the phenomena be regarded not only from the point of view of their mutual relationship and intercausality, but also from the point of view of their movement, development and change and from the point of view of their birth and withering away.

This conclusion of Marxist dialectics is of particularly great importance for the theory of cognition as well. It casts aside any abstract knowledge and points out that such knowledge is contradictory in its very essence because any abstract principle, upon closer examination, is transformed into its complete opposite. For example, it can be said with the same justification that all things are identical in some way or another to other things and at the same time differ profoundly from them. Lenin, in criticizing the "left Communists" for their unwillingness or inability to take into account changes in circumstances, emphasized that "it is necessary to take a tiny step forward, evidently, a step in the same direction, and the truth is transformed into error" [13].

The classical records of Marxism-Leninism stood firmly on the ground of an historical approach to the development of phenomena. They pointed out that with a change in the objective laws of reality there must also be a change in scientific laws. This is the essence of the dialectic historical approach, examining each phenomenon of social life as a moment in general development. However, it follows from this that it is necessary to examine from a historical point of view not only the past, but also the present, and then the latter appears before us to be the result of the first, and we learn to read the future from the present.

This possibility of reading the future from the present, without dreaming up any Utopias, in the opinion of Marx, is based on the fact that development transforms in conformity to laws and therefore, by studying the present we will learn to understand and formulate the law of this development. Marx and Engels regard all social phenomena in their development and change. In analyzing the phenomena of social life they rigorously stand on the factual basis of historical experience. For example, in studying the historical experience of the revolutions of 1848-1851, in 1852 Marx only stated that the proletarian revolution approached the task of concentrating all the forces of destruction against the state structure and the task of "smashing the state machine". The problem of how to replace this machine was not even considered by Marx at that time. At that time experience had still not yet provided material for formulating this problem. This problem was formulated by history only some time later, not until 1871.

Lenin particular emphasized this feature of the Marxian historical approach: approach the problem which must be solved by using as a point of departure the already manifested condition of the very problem which must be provided by historical experience and not thought up out of the head or constructed by means of logical reasoning.

For example, in examining the problem of forms of combat, Lenin pointed out that practical experience " . . . gives rise to newer and newer and more varied methods for defense and attack. Accordingly, Marxism unconditionally does not renounce any form of combat. In no case does Marxism limit itself solely to the forms of combat possible and existing at a particular time, deeming it <u>inevitable</u> that there will be new forms of combat unforeseen by the leaders of a particular period . . . In this respect Marxism <u>learns</u>, if one may express himself in this way from mass experience, far removed from pretenses of <u>teaching</u> the masses forms of combat which have been devised by 'systematic thinkers' sitting in some office" [14]. This instruction from Lenin must be kept firmly in mind by military researchers in order that they learn from living reality to find ever new methods for military operations in every case corresponding to their own special, specific circumstances.

The military leader must feel with constantly changing objective reality. Accordingly, his mental activity is intimately related to scientific hypothesis. He must learn to formulate scientific hypotheses rapidly which are close to

reality on the basis of an analysis of the experience of the past and present-day reality for direct practical application. The military researcher must not only generalize and reveal that which already is on the agenda for today's practical activity, but must also reveal that for which there is still no direct experience but which must already be sought in the practical experience of peacetime exercises or from the very beginning of a war.

Military theory can become positive and practical only if it is historically soundly based. To be sure, this does not make it mandatory to go back as far as possible in ancient times. On the contrary, we find the genesis of the present and the future in the immediate past. A study of the two world wars indicates very clearly that the new forms which these wars and the operations and battles occurring during them had assumed by no means a random genesis but were predetermined by specific historical conditions. Therefore, we must learn to look at the phenomena surrounding us from a historical point of view, understand them in their development and view them as something which is changeable, giving rise to something new, and not merely as an end result. Lenin taught: " . . . it is necessary to go forward and not look at the past, but at the future . . ." [15]. In order to validate a prediction of the future one must establish the law of development and this is possible only through scientific dialectics. An analysis of the present must reveal the disappearance of the presence in the future and the genesis of the future in the destruction of the present. The present must be understood as a step to the future. The future legitimately arises from the present and a prevision can be formulated only on the basis of a dialectic knowledge of the laws of this development.

A dialectic analysis always remains within the limits of facts. It only reveals their essence more thoroughly and makes clear the tendencies in development which they manifest. Developing technology has repeatedly surged into the field of military art and revolutionized it. It has seemed that all supports have been destroyed and it is necessary to radically reject all of the past in order to begin work on a completely new plan in accordance with newly developing requirements. However, later it became convincing to all that however abruptly the curve of development had changed it was always governed by historical factors. The point of crisis is unthinkable without steps preceding this crisis. Nothing occurs suddenly and without forewarning and nothing is generated from nothing. There is both a unity and an order in these changes despite apparent catastrophes.

Operational art and tactics of today cannot be devised arbitrarily as a result of mental processes because they have been established by history, and not only by the events of the day. They are always the results of a long process of genesis and development. It is impossible to understand the problems of the present without a historical point of view on matters. Only a study of the past can give orientation for the present and provide a basis for future plans. The present itself is only a fleeting moment pointing to the future.

The task of military research is to examine all military phenomena in their continuous development and to seek and discover the laws controlling development. The military leader, in studying historical experience, is not concerned with the past as such, but with the future. In his research work he uses the past and present as a point of departure and from an analysis of its elements and fundamental relationships he extracts initial data for application to future practice.

The strength of scientific knowledge of reality is that in revealing the profound internal laws of development of phenomena it provides man with the capability of acting with a knowledge of these laws, seeing the prospects for development, foreseeing future events and influencing them in his own interest. Precisely for this reason science in the course of its development should be oriented on revealed laws. I. P. Pavlov stated: "It is not essential to describe phenomena, but it is essential to reveal the laws of their development. Science gains nothing from descriptions alone" [16].

However, this does not mean that science must not be concerned with random happenings. Always hidden behind random events is necessity which determines the course of development in nature and society and which science must reveal and learn. Any knowledge can be considered scientific only to the extent that it perceives phenomena in their necessity. Perception cannot be based on random events. Science is the enemy of random events. Science always strives to find a law, the necessity, for random events.

By the term "necessity" dialectic materialism understands that which has a cause itself, something rich with inevitability regularly follows from the very essence, from the internal development of strength, processes or events, which inevitably must occur for the most part in such or such a way, not otherwise.

A random event is something which has a basis and a cause not in itself, but in the essence of the phenomena, processes or events themselves; it follows

from development caused by secondary or external factors and for this reason it may occur or it may not occur, it may occur in such or such a way, but it may also occur in some different way. A random event occurs in a process as secondary event, not as a primary, decisive event.

The fact that an artillery shell covers a very definite distance when fired at a particular elevation angle of the gun and with a particular magnitude of the charge is an event which is in conformity with a stipulated law and necessary. The magnitude of this distance is determined very precisely by the well-established relationship between the initial velocity of the shell upon its firing, the angle of elevation of the barrel and gravity. And if the shot is completed, the flight of the shell over this distance is completely inevitable and necessary. However, the fact that the flight range of the shell is somewhat reduced or lengthened under the influence of gusts of a headwind or accompanying wind which suddenly arises is random because this change does not follow from the essence of the fundamental relationships between the initial velocity of the shell, the angle of elevation of the gun barrel and gravity, but from an agent which is external for this particular process. It may occur given the particular relationship of phenomena or it may not occur.

A random event is not something denying necessity, alien to it, incompatible with conformity to law. Under conditions of reality, where not only the primary and basic, internal relationships of phenemona prevail, but also auxiliary, secondary and external relationships, necessity is manifested in the form of randomness of events. Regardless of the favorableness of conditions under which artillery shooting occurred, random events are always possible: a wind, which was initially absent, can arise; the direction of a shell can for some reason or other be changed in the higher layers of the atmosphere; it is not impossible that a change of air pressure and humidity may occur in some flight segment of the shell or there may be a change in the charge temperature prior to firing, etc. The effect of these random events is highly varied and contradictory; depending on these events the shell may travel farther or a lesser distance, be deflected either to the right or to the left, and these deflections may be more or less significant. At first glance it may even appear that there is no rigorous and definite law of the motion of a shell. However, after making a great number of firings and carefully studying the results of such firing persons became convinced that such a law exists and that it prevails

despite all random events and random deviations with an "iron necessity". The strength and necessity of the law is that in the last analysis it makes all random events conform to itself anf limits their effect. Random changes in the flight range of a shell occur more frequently the less segnificant these random changes are; vice versa, the greater the changes are in magnitude the less frequently they occur. Deviations exceeding some definite value to all intents and purposes cannot occur at all. Regardless of the variability of flight range under the influence of random factors, the mean flight range of a shell for a particular aiming of the gun and for a particular charge, in a sufficiently large number of firings will be a very definite and constant value. This mean range value corresponds precisely to the law of motion of a charge under particular conditions. It is also necessary. Thus, necessity and the inevitability inherent in it has won out over a mass of random events. In battle and in operations both sides have their plans which are based on a thorough analysis of combat realities, that is, they are causally governed. At the same time, each of the sides will strive to precede the enemy in afflicting an atomic strike. We will assume that one of the sides succeeds in doing this by virtue of the existing objective conditions. Then the other side of necessity dares such losses, which put it in an extremely disadvantageous position. However, it may be that the side party in inflicting a strike succeeds "by chance" in determining the time of the enemy strike (for example, from the reports of a deserter or an accidentally captured prisoner) and as a result can change the position of his forces. Then the results will be completely different because the strike will be inflicted on an unoccupied position.

This example is a perfect illustration of the great importance of a random event and its inseparable relationship to necessity.

The fact that both sides performed reconnaissance is not random and it is not tandom that both sides comouflaged their positions and screened their operations, but the fact that one of them at some particular moment succeeded in outpacing the enemy may also be random. To be sure, in an attentive subsequent analysis it may be possible to find the reasons for this random event,

but it has already played its role. Therefore, military science, in particular, does not allow an inderevaluation of random events. On the contrary, it devotes the most serious attention to the formulation of standords and rules insuring one's own forces against the occurrence of unfavorable events and also formulating procedures and methods for making use of favorable events.

Necessity and random events exist in an inseparable unity. Moreover, random events appear as a form of manifestation of necessity (necessity makes its way through a mass of random events) and as a supplement to necessity (a phenomenon may be necessary in one context and random in another). An example illustrating this point is the operations of forward battalions during the time of the Great Fatherland War. The necessity for their operations was dictated by the mission of reconnoitering the battle. However, by chance they played the role of a "special echelon" which performed a breakthrough of the leading edge of the enemy's defense.

With a change in conditions a random event can become a necessity and vice versa. So it happens during the time of the past war after the importance of the operations of advanced battalions as a "special echelon" became established. Such echelons later were purposely designated, that is the random became necessary.

For the reasons set forth above, no science neglects random events. Science uses as a point of departure the hypothesis that at the basis of random events there is some form of necessity or regularity controlling the random events which we see at the surface of phenomena. In mass phenomena in the physical world or in social life necessity stands out as the averaged result of the interaction of a mass of random phenomena. For example, for a single day it is difficult to establish a regularity of combat missions and the loss on some sector of the front during each combat mission. However, if we take

an interval of time within the range of a great number of days of active operations at a front, then it is possible to establish a definite pattern in military sorties and losses for each day; this serves as a basis for planning, for example, for bringing replacements of this type of aircraft during the course of the operation.

Patterns and laws in a great many other aspects of military art are also determined in a similar way. For example, only in this way is it possible to determine scientifically sound norms for the transported supplies of ammunition and fuel, the dependence of various operational and tactical norms on definite combat circumstances, etc.

In the generalization of a mass of random phenomenon there is reflection of the objectivity of statistical laws which science must study, thereby revealing necessity, which breaks its way through a mass of random events. Moreover, science must take into account that random events are favorable and unfavorable or desirable. For example, in military art the enemy's errors represent random events which are favorable for our side, whereas his are extraordinarily undesirable for him. The task of science is to facilitate where possible the prevention of unfavorable random events and assist practical workers to the maximum degree in making use of favorable random events. The task of military science in the example cited above is to provide practical leaders with such a manual as will to the maximum possible degree facilitate the prevention of errors on the part of their forces and lead the enemy into confusion.

If science desires to have a true picture of objective reality it must not ignore random events; however, it is necessary to be oriented on the discovery of laws rather than on the possibility of random events.

Military science must examine everything in its development and change. Such an examination does not allow military thought to stop and rust in idleness. The history of development of military art indicates that in the course of this development not only are new forms of combat created, but that old forms wither away. All military experience is unified in its own way. Under present-day conditions it is absurd to attempt to resurrect not only th strategy and tactics used by Napoleon, but even the methods for armed combat used during the Second World War.

The dialectic historical approach is directed against every and all forms of molds, against any and all universally operating agent. Precisely for this

reason the military researcher must master the dialectic historical approach If he does not do this, he will either repeat outworn dogmas or devise "theoretical hypotheses" which are completely unsuited for practical purposes. V. I. Lenin wrote: " . . . a Marxist must take into account real life, the precise facts of reality, and not continue to be bound by the theory prevailing yesterday . . ." [17].

3. Transformation of Quantitative Changes into Basic Qualitative Changes in Military Art

Marxist dialectics also provides a key to the understanding of the "mechanism" of development. Relying on many centuries of experience of mankind, it shows that the development of nature and society is a process in which the accumulation of unnoticed and gradual quantitative changes leads at a certain threshold to a jumplike transformation from these insignificant and latent quantitative accumulations to radical qualitative changes. Hence, one of the principal laws of dialectics is that quantitative changes undergo a transformation into qualitative changes; the transition from the old qualitative state to the new qualitative state occurs in a jump.

The proper application of this law in military research makes it possible to foresee those changes which occur in the methods for armed combat accompanying the mass use of new means of combat or those which were used earlier only to a small extent. For example, Soviet military researchers, long before the Great Fatherland War, correctly determined in their general outlines the methods for military operations which would prevail with the massed use of tanks, artillery and aircraft. A theory of total battle and operations, advanced for that time, was formulated.

It follows from the examined law in materialistic dialectics that development is not a simple repetition of what has passed, but a progressive movement, a movement along an ascending curve, from the old qualitative state to a new qualitative state, from the simple to the complex, from the lower to the higher.

In the field of military art this principle requires that war and its phenomena not be regarded as something which is stagnant, but instead as something which is dynamic. In his articles on the Franco-Prussian War of 1870-1871, Engels clearly demonstrated that this war, begun by France as an

expansionist undertaking, was transformed for that country in the course of its development into a qualitatively new phenomenon: into a national war of liberation. Its army also became qualitatively new because France, as a result of a number of mobilizations, was transformed into an "armed nation".

In the field of strategy, tactics and operational art we constantly observe the appearance of qualitatively new battles and operations, a transformation of defense into its own kind of opposite, that is, into attack and vice versa. War, the armed forces of the different sides and the organization of military units, divisions and larger grouping also qualitatively changed. All this was manifested with particular clarity during the time of the Great Fatherland War. Beginning for the Soviet Union as a defensive war, not only in its missions, but also in the methods by which the war was conducted, as a result of gradual changes in the quantitative relationship of forces and equipment of the different sides and as a result of the continuous increase in the number of battles and operations bringing victory to the Soviet forces and accordingly defeat to the German-Fascist army, the war underwent a radical change and for the Soviet Union was transformed into a war of attack. At the same time there was a qualitative change in the armed forces of both sides.

The German-Fascist army entered the war as a proffessional army, already having two years of combat experience, but in the course of the war, as a result of the powerful strikes of the Soviet Army, it lost its experienced manpower and replaced these troops with newly enlisted young and inexperienced officers and poorly trained soldiers from among the elderly population and the untried youth. Naturally, the continuous reinforcement of the army with such personnel led to a radical change in the quality of the German-Fascist army and a sharp decrease in its combat readiness. As is well known, Hitler's high command was tempted to compensate for this decline in the combat qualities of the army by increasing the number of troops on the Soviet-German front. However, this was an attempt with unsuited means because a large number does not always yield positive quality. For example, in social life a quantitative increase of the old, the outmoded, leads to reaction, regression, movement backwards.

In military art an excessive overburdening of the armies, particularly with poorly trained men, yields only harm, that is, it gives a negative quality. For this reason, the military leader must always very attentively approach the

solution of the problem of number; an effort must be made to attain the necessary quality. In many cases it can be heard that during a war the number of troops and the amount of equipment is always small. In actuality, this is by no means always the case. In organizing a battle and operation a commander determines the required forces and equipment, not in accordance with the principle "as much as possible", but on the basis of what number or amount is required for achieving the necessary quality, that is, for the best solution of the combat mission assigned. An excessive number of troops and equipment, the same as their obvious shortage, can only interfere with the execution of a combat mission, and in many cases both an excess or a shortage can lead to total catastrophe.

The problem of the quantitative relationship between manpower and various kinds of combat equipment when formulating the organizational structure of various military units is also of decisive importance for obtaining a definite and stipulated quality of these units. As a result of being overburdened with military equipment or manpower, such units can become little mobile, unmaneuverable, and as a result, ill-suited for present-day conditions. However a pronounced shortage of combat equipment or individual types of combat equipment can mean that these military units are put in a disadvantageous position in the face of an enemy which is better or more fittingly equipped.

In short, everywhere and at all times development occurs as the appearance of qualitatively new phenomena as a result of earlier quantitative changes. The military researcher also must without fail reveal this; if he does not, his research will not be rigorously scientific and will not result in a knowledge of objective truth. At the same time, he must thoroughly reveal and take into account both the quantitative and the qualitative character of military phenomena. If, let us say, a researcher, proceeding on the assumption that there are elements of defense in attack, whereas in defense there are elements of attack, drew the conclusion that there are no aggressive and defensive battles as such, but there are battles with a predominating element of attack and battles with a predominating element of defense, such a conclusion would be unscientific. These types of battles are qualitatively different from one another and they persue different objectives; they represent different conditions and forms of use of manpower and equipment. By depriving attack and defense of a qualitative definiteness, he thereby deprives us of the opportunity to penetrate into their objective essence, understand and reveal their laws.

To detect how and where and to what quality quantitative changes lead is a problem requiring serious thought, deep study of the facts and their specific and historical analysis. Great errors are possible without this. For example, it is known that some bourgeois military theoreticians committed a very serious error in evaluating the influence exerted on the method of armed combat by such weapons as tanks and aircraft on the basis of the experience of the war in Spain (1936-1937), they concluded that the mentioned combat weapons could not exert a significant effect on battles and operations and the principal means of combat remained armed infantry and artillery and also that a future war, for this reason, would be of the position warfare type. These sorry theoreticians did not comprehend that the new weapons, used in inadequate number, not only do not reveal their true combat possibilities, but frequently give the opposite impression. In order to apply the experience of combat in Spain for determining the basic characteristics of a future war it was necessary to take into account more than the results which were obtained by using hundreds of tanks and dozens of aircraft. It was necessary to visualize what would occur if thousands of tanks supported by hundreds and thousands of aircraft appeared on the battlefield.

New weapons have never caused radical changes in combat methods if used in inadequate numbers. For example, machine guns were already used in the Russo-Japanese War of 1904-1905. However, at that time field fortification had been considerably developed. However, both these factors exerted a decisive effect on the character of armed combat only during the First World War, that is, when both came to be used in mass numbers. The situation was the same with tanks and aircraft which came into use as early as the First World War, but revealed their full capabilities only during the Second World War when they were used in mass numbers.

In all the examined cases, like in many others in which the military researcher must examine the problems involved in the transformation of quantitative changes into radical qualitative changes he must deal with the category of "measure"; this "measure" reflects the unity of quantitative and qualitative definiteness inherent in specific objects and phenomena. This category plays a major role in dialectics and in practical activity, including military matters.

Thus, a new weapon causes fundamental qualitative changes in combat methods only when the available number of such weapons reaches a definite level, a definite "measure". Under the conditions surrounding the use of atomic weaponry the problem of dispersal of forces for the purpose of preserving one's forces against enemy atomic strikes assumes great importance. However, if a definite measure is not taken into account in so doing, if forces are dispersed in such a way that they will constitute isolated groups not in contact with one another, in this case number is transformed into a quality in which the forces cannot execute the missions assigned them.

The military researcher, in analyzing any problem relating to the relationship between number and quality, must intelligently find that "measure" whose violation can result in his forces being exposed to unfavorable conditions. At the same time he must assist commanders in finding those critical points and critical junctions at which the jump, the appearance of a new quality, begins. This is necessary for determining the choice of the time of a strike, the introduction of reserves into a battle, the time for carrying out parachute attacks, etc. In general, war and its phenomena are in a process of constant change; they are characterized by moments of crisis, transitions from one state to another, turning points and junction points. All this must without fail be made clear in the course of a study in military science. War and its phenomena cannot be understood without this.

4. The Struggle of Contradictions. The Moving Force in the Development of Military Matters.

A point of departure in the Marxist dialectic method is that natural objects and phenomena are characterized by internal contradictions, that everything has its negative and positive sides, its withering and developing sides, and that the struggle between the outmoded and the newly developing is the internal content of the development process.

The struggle of contradictions leads forward, such is the law of dialectics, the law of unity and the struggle of opposites, playing an exceptionally important role in any scientific knowledge and in practical activity.

This law reveals the internal content of any development and as a result, V. I. Lenin called it the core, the essence of dialectics: " . . . life goes

forward in contradictions", he wrote to A. M. Gor'kiy, "and living contradictions are many more times common and varied and with more meaning than at first appears likely to the human mind" [18].

Another law of the development of nature, society and human thought is the law of "denial of denial", which is closely related to the law of unity and the struggle of contradictions. In emphasizing the very close relationship between these two laws, F. Engel's wrote: " . . . it must not be forgotten that the form of any unconscious development is a denial of denial, movement by means of struggle between opposites . . . " [19].

The inestimable importance of the law of "denial of denial" in dialectic materialism for any science and practical activity of man is that it indicates the inevitability of denial of the old by the new, rejection of the outmoded by the progressive. If there was no moment of denial in development, the replacement of the old by the new in general could not occur and therefore forward movement would also be impossible.

The effect of the "denial of denial" law is observed constantly. Even in the simplest example cited by Engels in his work "Anti-Dyuring" (development of grain), it can be seen that in the scientific dialectic sense "to deny" does not simply mean to say "no". The actual importance of denial is that a particular object or phenomenon is developed on the basis of internal contradictions, without destructive interference from external forces, that is, under conditions of universal interrelationship and intercausality normal and usually characteristic for the particular object or phenomenon. For example, if grain is crushed, this will not be dialectic denial, for the development of grain this is a pure random event, in actuality an exception in its process of development. In order for dialectic denial to occur the grain must remain under normal conditions, that is, it must enter the soil, and then, with appropriate climatic conditions, it will germinate and its stem will become a "denial" of the grain. Further normal development leads to the maturing of the head, which is then "a denial of the denial".

Then the process of "denial of denial" is repeated, but now on a new and expanded base, because no longer does a single grain enter the soil, once again during normal development, such as we mentioned at the beginning of our discussion, but all the grains of the matured head then enter the soil. These grains will be different ones than are "initial" grain. In the course of

development the number of grains not only became greater, but each of them acquired a new quality. This new, undetectable to the eye, but gradual quantitative accumulation of grain leads in the long run to the appearance of an entirely new quality, a different variety of grain, a new species, etc. As is well known, the progressive Michurin science, with its tremendous importance for practical work, was formulated precisely on this changeability of initial "data" under the influence of external conditions.

From this highly simple example like from countless others which are constantly displayed before us by nature, it can be seen that this development is not a naked, latent and random denial. Without fail it involves the preservation and reworking of what was valuable, what was accumulated during the preceding stage. The rejection of the outlived and the retention of the positive which had been attained mutually supplement one another. Without a combination of the new with the old, without a unity of these contradictions, there can be no relationship between the preceding and successive stages and there can be no historical continuity. "Not naked denial, not latent denial, <u>not skeptical</u> denial, hesitation and doubt are characteristic and significant in dialectics, which undoubtedly contains in itself an element of denial . . ., no, this is denial which is an aspect of relationship, an aspect of development, with retention of the positive, that is without any hesitations and without any eclectics" [20].

This is fully confirmed not only by the process of development in nature, but by all the historical experience of human society, including the development of military art. F. Engels points out, for example, the development of land ownership from primitive-communal through private ownership to socialistic ownership of property as a clear manifestation of the law of "denial of denial". Engel's took another example from the history of philosophy. The initial step in the development of philosophical thought was primitive elemental materialism. Due to its historical limitations it was subjected to denial by idealism. However, idealism in turn is denied by present-day scientific materialism, which, including in itself all that is positive, produced by earlier philosophical systems, moved philosophical thought considerably ahead and for this reason represents a qualitatively new stage in the development of philosophy.

Not less convincing examples of development through the law of "denial of denial" can be cited from the field of military art. For example, the point of

departure for the development of methods of armed combat can be regarded as the maneuvering collisions of poorly organized armed groups taking advantage of terrain conditions and suddenness of attack, however, this singular primitive singular "maneuvering tactics" was made obsolete by the organized operations of an integrated mass of armed men. The phalanx, which had little mobility, was victorious in primitive "maneuvering tactics". However, at a later time the phalanx was itself subjected to "denial". It was overturned by the manipular combat formation of the Romans, that is, qualitatively new maneuvering tactics, representing a higher achievement in military art during an epoch when gunpowder was not yet employed.

With the appearance of weapons using gunpowder the process of "denial of denial" was repeated. The maneuvering tactics of infantry and cavalry, as it emerged from the Middle Ages, was made obsolete by the tactics of a linear battle formation, the singular phalanx of the era of smooth-bored firearms. Then the line battle formation was replaced by the tactics of columns and extended formations.

However, development did not stop with this. If the tactics of columns is regarded as a new point of departure for development, it was subjected to denial by a qualitatively new battle formation, the extended firing formation. During the First World War combat assumed the character of a collision between two giant phalanges, extending "from sea to sea". At the present time we find ourselves at the stage of a new denial. A process is occurring of denial of the above-mentioned gigantic phalanges by a singular "manipular" battle formation of modern type. Beginning even during the Great Fatherland War, the process of destruction of modern "phalanges" can be brought to a final end by the use of atomic weapons. Military operations in a future war are conceivable only as having the ultimate in maneuvering. Accordingly, the principles for organizing armies and their tactics, as well as operational art, must be formulated on the basis of this consideration.

All these examples show that the law of "denial of denial" reveals the progressive character of development, because if the old is denied by the new, the latter, after it has grown old, will be denied by something newer, and so it will continue forever, with the old giving way to something newer, more progressive and more advanced, that is, at all times along an ascending curve. However, this curve is not a straight line because the new does not completely deny the old, but retains its most valuable features.

At the same time, this is not movement in a closed circle, since the elapsed stage can never be repeated. Only some of the characteristics of the old are retained in the new. Accordingly, the law of "denial of denial" indicates a spiralling character of development and further indicates that the latter occurs in an ascending spiral. In characterizing this peculiarity of the examined law in dialectics, V. I. Lenin, in his article entitled "Karl Marx" wrote: "Development, seemingly repeating stages which have already passed, but repeating them differently, at a higher level ("denial of denial") is development, so to speak, in a spiral, and not along a straight line . . . . " [21].

It follows from the laws of dialectics "unity and struggle of opposites" and "denial of denial" that there is a requirement for revealing the contradictions characteristic of objects and phenomena and seeing the struggle between opposite tendencies existing on the basis of these contradictions, boldly stand on the side of that which is new, developing and progressive and to assist it in coming about and developing in the struggle with the old, the outlived, the reactionary and the negative.

In military art the old does not die out and the new does not take foothold all at once; they exist at the same time for a considerable period, live side-by-side and at times one rises in its development over the other. Everything has its past, present and future. The methods for waging wars, operations and battles, the organizational forms of the army and methods for instructing and training troops were not the same in the past as now and in the future they will again experience changes. It is very important that the military researcher focus his attention primarily on the discovery of contradictions, that is, make clear the changes in the conditions occurring from the time when the investigated phenomenon had its genesis and thus discover that which is new and which must be supported, create better conditions for its development in order to insure that it will win out over the old, and thereby raise military science to a new and higher level.

The struggle of opposites, internally characteristic of all phenomena, also permeates from beginning to end the phenomena of armed combat. If we attentively study any phenomenon of war, without fail we discover its internal contradictions. For example, attack, in addition to having positive and active

bases, also involves the worst characteristics of defense, that is, its passive aspect.

Attack is the result of a real superiority of forces and equipment, but the attack forces are gradually exhausted. During an attack it is necessary to safeguard the flanks and rear. Troops suffer losses in battle and from diseases, military equipment becomes inoperative as a result of combat losses and for technical reasons and men become fatigued and require rest. There also is an extension of communication lines and they are broken by the enemy and this can result in a disruption in the bringing up of materiél of all kinds. All these factors lessen the possibilities for attack and if sufficiently effective measures are not taken to counteract this an attack, meeting with delays and obstacles, is stopped. A crisis occurs, and as a result the attack is transformed into a sort of opposite, into the worst kind of defense, into a passive defense without adequate manpower and equipment.

A highly important task of military leaders is to formulate in theory methods for overcoming factors which are negative for the operation of our forces and to be able to clearly define these factors in the course of combat operations. The military leader must learn to see the development of specific events in their internal contradiction so that on this basis he can by his own efforts direct these events into the necessary direction for his purposes.

A classical example of precisely such an approach to the analysis of phenomena of war is pointed out by F. Engels. For example, in analyzing the first period of the Franco-Prussian War of 1870-1871 he finds contradictions which were expressed in those frictions, seemingly insignificant at first glance, which are inevitable in any war (lack of hardtack, mess kits, embezzlement). However, Engels reveals these frictions, seemingly insignificant at first glance, as fatal symptoms of the paralysis overcoming the French army. Later he notes the contradictions between the requirements of strategy and tactics and politics, which constantly increase. Finally, the Sedan catastrophe was a culminating point in these contradictions. Because of the fact that in his very first notes Engels laid bare these contradictions it was easy for him to trace the development of events and predict the Sedan capitulation. This would put an end to the Second Empire and its basic support, the army.

Engels also examined the second period of the Franco-Prussian War from the point of view of the development of contradictions. Immediately after Sedan Engels noted an abrupt change in circumstances. In an article dated 17 September ("How to Fight with the Prussians"), he writes that "the defense is becoming stronger and attack is becoming more difficult". Beginning with that time Engels devoted all his attention to tracing the new contradiction. The Germans advanced, but their advance led to a strengthening rather than a weakining of the French. From the very onset Engels points out how the Prussians could be defeated and traces what the French did in this direction. He attacks Trochu very sharply and sees him guilty of inaction and irresolution. Analysis of events soon suggested to Engels another contradiction which was holding back an increase in French resistance. He discovered symptoms indicating that the French army was being deprived of strength as a result of development of the class struggle in France.

Examples of the skillful clarification of contradictions in the course of the war and the proper resolution of these contradictions were given by the Central Committee of our Party and the General Headquarters of the Soviet Armed Forces during the course of the Great Fatherland War. In a radio address on 3 July 1941 I. V. Stalin gave to the people an illustrious analysis of the prevailing circumstances and the prospects for the war which had been made by the Central Committee of the Party and the Soviet Government. In those contradictions between the goals of the block of Fascist states and their real capabilities, unnoticeable at first glance, our Party, guided by genius, was able to see the fundamental vulnerable points which our people had to exploit in order to achieve total victory over the enemy. During the course of the war the Party laid bare the internal contradictions of the enemy which were weakening his forces and our own contradictions, and the Party did this in time and with great thoroughness.

The correct and timely revelation of these contradictions was the basic condition for overcoming our weaknesses and exploiting the advantages which we had and was also fundamental for the proper selection of the place and time for inflicting decisive blows on the enemy.

For example, a correct solution was found for the contradiction existing at the beginning of the war between the moral superiority of our forces or the enemy and our marked inadequacy of aircraft and tanks, that is, those

weapons of combat without which combat is extraordinarily difficult under present-day conditions. The proper use of the contradictions burdening the enemy and weakening his forces made it possible to carry out the successful counterattack around Tikhivin, Rostov and Moscow and prepare and conduct such operations as those at Stalingrad and Kursk which determined the final turning of the war in the favor of the Soviet Union.

The analysis of the process of development of one of the contemporary wars, made by Engels, and the entire course or such a grandiose war as the Great Fatherland War, indicate the dialectic character of war, that it must be regarded as a process which is unified but varying in its phases. War is always characterized by moments of crisis and certain turning points. At its basis does not lie a single decision, but an entire series of new and newer decisions, as difficult and as important as the first. During war too many of the forces which fed it initially are expended, but on the other hand, during the course of the war new forces are generated which provide it with sustenance for the struggle. For this reason one can foresee only the tendencies of future development. Their specific realization will be dependent upon a great number of conditions.

Both war as a whole, and an individual operation or even a battle, cannot be waged without a plan. However, the initial plan for a war, operation or battle cannot be inflexible. In any such plan it is impossible to take into account to an adequate degree the changes which may occur in circumstances during the course of implementing this plan. Therefore, planning in military operations, in order to insure the flexibility required in war, must serve only as a basis for further planning. An adopted decision assumes that when circumstances change and a contradiction arises between new circumstances and the old decision it will be necessary to make a new decision, which at the same time will be a continuation of the decision which has been replaced or lost its full validity. The same situation applies in military theory. The conditions for armed combat change and it is also necessary to change the forms and methods of combat; the contradiction between the new content and the earlier forms must be resolved.

Content and form are characteristic of all things and processes in reality. In the objective world content is the internal aspect of objects, representing a combination of elements and processes forming the basis for the existence and

development of things. Form is the organization and structure of content. In phenomena belonging to the sphere of consciousness form is an expression of content.

Form is not something merely superficial in the content of a subject or something which is externally superposed on content. To be sure, objects also have an external form, such as a spatial-geometrical form, and it always is visible to the eye. However, the manifestation of form is not limited to this. Form is inwardly characteristic of content. The external form is the result of a definite combination of many internally formed components and is the result of the totality of content, consisting of an enormous number of formed partial elements.

Therefore, external form is not at all identical to internal form, characteristic of content. For example, the combat formation of a unit or division has its internal structure (the units and subdivisions making it up and appropriately organized). At the same time, this combat formation also has an external form, such as a two-echelon structure.

The relationship between the external and internal form and the content of an object has a different nature in different objects and processes and it is exactly this which indicate that form is not something superficial, but also internally penetrating and permeating the content, which was formed in all its elements. Content and form mutually penetrate one another; content is formed and form has content.

Each of these opposite aspects, interrelated to other phenomena, can first appear in the role of form and then in the role of content. For example, the organic structuring of forces is a form of existence and the effect of the manpower and equipment used in armed combat. However, if we take a definite organization of troops in another interrelationship, that is, as a component part of the combat structure of a higher military command, the organic structure will itself represent the content of this structure. Regarded in a different light, form is manifested as content. For example, the form of combat formation can appear as the content of a study in military science.

Thus, there is no form not filled with content, not organizing movement and activity of content, the same as there is no content which is not structurally expressed in some form. There is no content whose development does not

cause changes in its form, like there is no form which in turn does not influence the development of content. However, in this interrelationship the primary and decisive role is played by content because only it represents the basis of things, moving matter.

Form cannot exist in isolation from content. Its basis is content, and for this reason it is dependent on the latter. For example, in armed combat the true content of combat is the actions of armed men. The methods for this combat, being its external form, naturally cannot exist if there are no actions and no armed men, no combatting armies.

However, form nevertheless has a relative independence which is manifested in its greater stability in comparison with the rapidly changing content. This is confirmed by many facts from the life of nature and society and by the development of military phenomena. For example, the forms of organization of troops, dependent on combat methods, have a considerably longer lifetime than these methods. In turn, the latter are retained for more or less prolonged periods of time after the content determining them, that is, the manpower and armament of the forces, have changed.

Developing content is not content with this. It has a tendency to generate a corresponding form, and as a result the latter is an active participant in the development process, the moving force of the development of content. In military art the contradiction between the new conditions for waging war and the old, outmoded forms and methods for armed combat constitute one of the principal contradictions for moving military art forward.

Naturally, this contradiction is manifested in various fields of military art and differently in different respects. For example, it can be manifested as a contradiction between the armament of the forces and the methods for using this armament. Usually the armament, since it is dependent upon the development of productive forces, that is, on the most revolutionary element of production, outpaces tactics and operational art in its development. The military researcher must make this clear and bring the latter into correspondence with the former. However, it also happens the other way around. During the course of a war, especially a revolutionary war, the creativity of the masses gives rise to new and progressive combat methods requiring changes in combat equipment as well. So it happens, for example, during the epoch of the

French bourgeois revolution late in the eighteenth century, during first wars the people revealed " . . . a gigantic revolutionary creativity, recreating the entire system of strategy, breaking all the old laws and customs of war and creating in the place of the old forces a new, revolutionary, people's army and a new method for waging war" [22].

Another, still clear example of the powerful effect of sociopolitical changes on military art is the appearance of Soviet military science on the basis of the victory of the socialistic revolution and the defense of its great victories. The effect of military art on the development of combat equipment was felt particularly clearly during the time of the Great Fatherland War. The most modern military equipment was supplied to the army in ever-increasing quantity.

The next, equally important contradiction in military art is the competition between the means of attack and defense. From the most ancient times any means used by the enemy for attack has been countered by a corresponding means of defense: the lance was countered by the shield, the bullet was countered by the field shelter, the shell was countered by armor, etc. At the same time, the combination of means of attack and defense in itself represents a unity of contradictions. Each time we find not only the best means and methods for attack, but also the means, procedures and methods for defense against the means of enemy attack. The fundamental guiding principle which permeates all aspects of military art is a principle which includes within itself a unity of opposites: preservation of one's own armed forces and annihilation of enemy forces.

As is well known, war is a continuation of force. However, force can prevail only over those who are weaker and admit their weakness, that is, it is necessary to have powerful armed forces and deprive the enemy of corresponding forces, that is, make him militarily weak, incapable of exerting further resistance and forced to submit to the will of the victor. If this cannot be achieved by armed combat, war would lose any meaning and no one would ever have recourse to it.

Precisely for these reasons the principle of preservation of one's own forces and destruction of enemy forces is the fundamental guiding principle for all military art. Beginning with the fundamental rule of armed combat ("protect yourself and inflict damage on the enemy") and ending with the laws

of strategy, everything conforms to the mentioned guiding principle. However, this principle, as clear without any explanations, represents a unity of opposites, which best of all indicates the development of military art by a struggle between opposites.

The contending sides, both during the time of preparations for war and during the course of the war, constantly strive to find means and methods for attack and defense which are more effective than those at the disposal of the enemy. This constant competition is the basic moving force in the development of military art. This competition occurs in all fields included in the sphere of application of various forms of combat. For example, it was known long ago that attack has all the advantages over defense, since the objectives of war are not attained by defense alone, In order to achieve victory it is essential to attack. However, defense also has some advantages over attack. It is a form of combat which makes it possible by the use of forces smaller than those at the disposal of the enemy to stop his advance temporarily or hold an occupied position, at the same time inflicting such losses on the enemy that it will become possible to bring the contending forces into balance at first and then achieve superiority over the enemy. Accordingly, no one fails to provide a defense. Moreover, war by its very essence is unthinkable without the use of both defense and attack.

In war attack and defense are not only mutually opposite, but they are also aspects which necessarily accompany one another. "Without one side, there cannot be another side. Combat and the mutual connection between these two sides form the integral nature of war, give rise to the development of the war and dictate the outcome of the war" [23]. In actuality, if we consider the entire process of war, attack by one side usually presumes defense by the other. If we consider one of the contending sides, attack in one direction by one side is combined with defense on the other side and attack is insured by defense. Attack and defense are antipodes, and at the same time they do not exist without one another, so to speak, in "pure" form. There are no "pure" phenomena in nature or in society and there cannot be; this is taught in Marxian dialectics, showing us that the very concept of purity is a sort of narrow-mindedness, a one-sided human form of understanding not thoroughly comprehending a subject in all its complexity" [24]. Moreover, as a result of the struggle between opposites, one phenomenon can develop into another and even into its complete opposite, that is, attack can develop into defense and vice versa.

Development by means of struggle between opposites is also observed in the development of military equipment. The competition between arms and armor was discussed by F. Engels in his work "Anti-Dyuringe". However, the entire process of development of military equipment proceeds through the struggle between competing tendencies. The appearance of tanks gave rise to antitank artillery, antitank guns and grenades, antitank mines and other antitank barriers. The appearance and development of aviation gave rise and stimulated the development of antiaircraft weapons, apparatus for detecting aircraft, fire control, etc.

If we consider any combat weapon individually, we will see that during its development and improvement one must take opposite tendencies into account. For example, during the improvement of tanks it was necessary to insure not only an increase in the power of the guns and the armor protection, but also an increase in maneuverability. These problems are interrelated. At the same time they are contradictory because the first is an impediment to achieving the second. For this reason designers must seek radically new solutions which will best insure the attainment of the different objectives. One of the examples in the development of aircraft can illustrate how this occurs. The requirement for a continuous increase in the speed of aircraft resulted in an increase in the power of engines and an associated constant increase in their weight. As a result, the new increase in aircraft speed required such an increase in the weight of engines that the aircraft could not even take off. The solution of this contradiction led to a radically new decision, the creation of jet engines, which now have completely eliminated reciprocating engines from high-speed aircraft.

A serious contradiction in the development of military art at the present time is the contradiction between the need for dispersal of forces for the purpose of their preservation against atomic bursts by the enemy and the need for a rapid concentration for inflicting decisive blows against the enemy with superior forces and equipment. The solution of this contradiction is of the greatest importance both in modern military theory and in the everyday practice of commanders and staffs at all levels. The proper solution of this contradiction means that a situation must be created in which at any time an atomic strike by the enemy will be inflicted on a dispersed combat formation of our troops which is least vulnerable for such attacks and which at the same time will force the enemy to concentrate his combat formations to the maximum for

operations against our troops. The proper solution of this contradiction also requires an intelligent use of dispersal by the enemy in his own interest and a real concentration at a particular time in a particular place for smashing hostile forces by units with superior manpower and equipment.

Military leaders must also consistently overcome the contradiction between the constant introduction of newer and newer combat equipment into the army, development of ever-improving methods for conducting combat operations and improvement in military organization, on the one hand, and the inadequate readiness of the personnel in the armed forces for all these developments, on the other hand. The solution of this contradiction results in progress in the development of military art and the combat and political readiness of troops and gives rise to ever-newer and more perfect forms of this training; it requires from all personnel a straining of forces and capabilities for achieving a still higher combat readiness and combat capacity.

Marxist dialectics teaches that vitally important contradictions must be intelligently revealed and solved. Dialectics, and especially its most important law, the law of unity and the struggle between opposites, indoctrinate our personnel in the spirit of readiness and the ability to overcome any difficulties, smashing all obstacles standing on the way to victory, struggling for the transformation of favorable opportunities into reality.

Possibility and reality are two definite interrelated aspects of the movement and development of phenomena in the objective world surrounding us and probably of the process of learning concerning them.

Each specific manifestation of the universe, infinite in time and space, does not exist forever, does not persist eternally. In the course of movement and development some actually existing phenomena are replaced by others. The new phenomena do not, so to speak, fall from the sky. They do not arise without certain premises. Before becoming reality, they must first exist and exist in the form of the possibility of their occurrence, created by definite earlier-existing phenomena as the conditions under which this possibility exists.

Possibility is created by the pressence of objective necessity, laws in nature, as a result of which definite conditions afford definite possibilities. However, the possibility is related not only to a law or necessity, but also random events.

Possibility is random because it is something which may occur or may not occur. Countless possibilities of individual phenomena in nature are generated by the effect of random factors. For example, the possibility of falling of a certain amount of precipitation in a particular region on a particular day is determined by a great number of random circumstances and therefore this possibility itself may be extremely different.

It is necessary to distinguish rigorously the possibilities of this kind from the possibilities in which historical necessity is expressed. For example, the possibility of replacing one social structure by a more progressive one. This kind of possibility also bears the imprint of a random event. However, this is not in the sense that it may occur or may not occur but in the sense of the presence of random, individual, unrepetitive peculiarities in it. For example, the replacement of feudalism by capitalism in Germany occurred more completely than in France and in Russia, and differently than in Great Britain, etc.

Any possibility in nature is based on a definite objective law, and if this law is operative, the possibility is without fail transformed into reality. Relying on objective laws, man in the course of his modification of nature consciously and purposefully creates conditions for bringing about possibilities of nature useful for human practical purposes. At the same time man strives to avoid unfavorable random events and does not wait until the conditions necessary develop of themselves under the influence of random and natural forces. Moreover, man also creates artificial conditions for the exploitation of possibilities which in themselves are not encountered in nature, in this way he brings about and transforms into reality those possibilities which in general do not arise without the interference of man in nature.

With respect to social life, here the activity of man is a highly important condition for the transformation of possibilities into realities. The objective laws of social development are not manifested other than through the activity of man, be it spontaneous or conscious. Objective laws create the possibility for solving various problems in social development, the possibility of various social transformations. However, for the transformation of these possibilities into reality there must be an active participation of man. In realizing the possibilities created by the laws of social life, the subjective conditions, element of consciousness, purposefulness in human use of the objective conditions which are necessary for the transformation of possibility into reality acquire enormous importance in addition to the objective conditions in themselves.

In the development of social life a factor of particular importance is the extent to which man recognizes various objective possibilities in order that he can use them; it is important whether man has the desire to use them and whether he has adequate energy to do this. For example, it has happened in more than a few cases in the past that some country has had the full possibility for achieving victory in a war. However, this possibility remains unexploited because the political and military leaders were incapable of using the objective conditions. Such was the case, for example, in 1940 in France; it was incapable of resisting the German invasion because of the rottenness of its political regime and due to the incapacity of its political and military leaders to deal with its defense.

In its struggle against fatalism, Marxism-Leninism at the same time wages a relentless struggle against subjectivists, who deny objective conditions and laws as a basis of objective possibilities and their transformation into reality. Marxism-Leninism teaches that only activity based on objective possibilities and objective laws is productive.

"A military leader cannot win a victory if he operates outside the framework which is set by objective conditions, but he can and must actively win victories within the framework of these conditions. The arena of activity of the military leader is limited to what is allowed by objective conditions, but within this arena he can create a great many beautiful and magnificent productions" [25].

Subjective conditions also operate through objective conditions, expressing in them conscious and purposeful use. The problem of the importance of a subjective factor for the realization of any possibility in social development is a problem of how consciously and purposeful people are in the course of their activity in ensuring a field for action in a particular direction of that objective law on which this possibility is based.

In life we observe more than the transformation of possibility into reality. By virtue of the objective laws of development inherent for it, reality itself contains definite possibilities for its change. Frequently it may include different, including opposite possibilities. For example, in head-on combat there are possibilities for victory of either side. The winning out of one of these possibilities, its realization and its transformation into reality means the elimination of the opposite possibility.

However, if the conservative possibility is victorious in social life, this makes sense only for a particular, separately considered stage in development. The winning out of this possibility and its realization can mean a temporary postponement in the resolution of this problem, but it cannot remove it from the "agenda" because it cannot eliminate the historical necessity of further progress.

A knowledge of the invincibility of the new in social development inspires the progressive and revolutionary forces with a faith in the future, in the inevitability of their victory, arouses them to active struggle for their victory and in such a way that they will use in full measure the objective conditions and possibilities for this victory.

Our country and its armed forces, defending the most progressive and advanced social structure, have all the possibilities for obtaining victory over any enemy. Therefore, the objective of our military science is to reveal in all branches of military art the most probable ways to transform these possibilities into reality, into victory over any aggressor who risks attack on our country, all this under continuously changing conditions. Marxist dialectics, and especially its law of unity and struggle between opposites, is a reliable instrument for solving this problem.

5. Methods for Studying Military Phenomena

The scientific investigation of phenomena in social life can be done by two methods: historical and logical. Both these methods are different manifestations of the Marxist dialectic method. In the historical method for the study of facts and events a study is made, insofar as possible, in all the sequence and all the scope which occur in reality, that is, including the various zigzags, deviations and random events through which the thread of objective laws pass. In the logical method facts and events are presented in generalized form, in the required regular relationship, that is, excluding everything which is random, unimportant and atypical. However, the logical method, as pointed out by Engels also requires historical illustration, a constant contact with historical reality and with a demonstration of the process of development.

Thus, each of these methods has its own characteristics. However, they cannot be contrasted with one another. It is inadmissible to regard them as completely opposite, because, as pointed out by Engels, the logical method

" . . . in essence . . . is the same as the historical method, but freed from its historical form and from disrupting random events. That which gives rise to history should also represent the beginning of the course of thought, and its further movement will represent nothing else but a mere reflection of the historical process, assuming an abstract and theoretically consistent form; the reflection is corrected, but corrected in conformity to the laws given by the true historical process itself and each phenomenon can be regarded at the highest point of its development, in its full maturity and perfection" [26].

In order to understand more thoroughly the application of any of the mentioned methods, we will briefly recall the philosophical concepts "logical" and "historical".

"Logical" and "historical" as categories of dialectic logic are a reflection of the concepts of historical development of objects and phenomena.

As is well known, any science is capable of developing only to the extent that it takes into the account the new findings of life and practical experience and reflects them in its concepts, categories and laws. Marxism is hostile to everything which is scholastic, everything which is theoretized, cut off from the living soil of historical development of reality and from the progressing practical experience of social life. The point of view of practical experience, pointed out by V. I. Lenin, must be the first and the fundamental point of view of the theory of cognition. The breakdown of the logical and historical in any science means that it stops in its movement, that it is incapable of satisfying the needs and demands of developing life.

The logical and historical are in such a unity in which the historical, that is, the developing objective world, governs the logical, being a reflection of the historical, and by virtue of this secondary relative to it. This can be seen very clearly in the example of the derivation of logical concepts. All concepts are generated from practical experience and summarize and generalize that which has been given in real life, in practical experience. Since practical experience develops historically, concepts arise as "junctions", marking a definite historical stage attained by social practice in the human consciousness.

The understanding by Marxist dialectics of the logical as a concentrated theoretical expression of the historical process makes it possible to take into account carefully everything which is new, which arises in life, and to put into

specific form general concepts and general formulas in accordance with the new conditions. Some concepts are more stable and need be refined less frequently, whereas others must be refined more frequently. For example, quite recently, when determining the storming of water barriers with systematic preparations, the greatest attention was given to the crossing of advance subunits and the suppression of enemy firing positions situated along the waterline. It is entirely obvious that at the present time a determination which emphasizes this will be quite incorrect because it does not take into account the effect of the most powerful and most long-range weapons used in armed combat.

One of the expressions of the unity of the logical and the historical in knowledge is the complex dialectic relationship between the general, the special and the individual.

As is well known, the general is that which is important, necessary and inherent in a mass of special and individual phenomena and processes. However, it would be incorrect to assume that on this basis it is possible to deduce the special and individual from the general by a linear, purely logical method. In actuality, the general always is interpreted through the special and the individual. The failure to understand this has more than once led workers in science and practical fields of endeavor, including military specialists, into a blind alley. This can be illustrated in the example of the long-waged and still unfinished dispute between the adherents of the "applied" and "theoretical" methods for teaching military art.

The metaphysical boundary drawn between science and art by the adherents of the applied method exists only in their consciousness. Science develops due to art, art is based on the achievements in science, and this process never ends. "Not science, but art, is something that only a metaphysicist would say. Science is an 'extension' of art . . . Any art is more or less 'scientific', any science is not so 'scientific' as to get by without being supplemented by art. That which in an 'examination' is a law, in action becomes a rule. That which is a law in science is a rule in art. The gap between science and art is a gap between the past and present, between theory and practice. This gap is contrary to the spirit of Marxism" [27].

Lenin characterized the striving to find answers in a simple logical development of general truth as a debasing of Marxism and a mockery of dialectic

materialism. Lenin always demanded that the general be used specifically with allowance for the singularity of historical conditions which inevitably modify the general.

The results of study are summarized by any science in the form of definite concept and categories, laws which must be a reflection of the historical relationship between phenomena and which must be derived one from the other in accordance with the actual history of the investigated subject. However, more than formulations, the formation of concepts and categories, is important for science. In addition, it is necessary that their systems be developed. Here there is not and cannot be anything arbitrary; here the strictness logic, independent of the will and desire of the researcher must dominate.

Logical thought requires transition from the simple to the complex; this is dictated by the need for a proper reflection of true reality, which develops specifically from the simple to the complex. However, this principle is not absolute. Marx pointed out the complete legitimacy and even necessity of movement from the complex to the simple as well. Not only the earlier development affords the possibility to comprehend its result, but also the latter, as the highest point of development, makes it possible to obtain a better view and understand more profoundly what has occurred in the past, and see in what has been completed the mature form of that which earlier had appeared only in its rudimentary form, frequently in a hazy and vague form, because " . . . it is easier to study a well-developed body than the cell tissue of the body" [28]. Herein lies the great strength of the logical research method.

The interrelationship between the logical and the historical in the process of cognition includes both the aspect of identity and the aspect of difference; the difference not only does not remove their unity and interrelationship, but on the contrary, even more sharply accentuates and clarifies the fact that the logical is a reflection of the historical.

The historical method cannot be represented as an empirical description and registry of the facts. This method must reveal the same logic and the same laws as the logical method, but whereas the latter does this in an abstract-theoretical form, the former reveals the same logic in the "flesh and blood" of specific events, the activity of peoples, classes, parties and individual personalities.

It also must be remembered that not one of the mentioned methods is applied in pure form. As necessity dictates, specific events, individual random happenings and the activity of historical personages are examined for study by the use of the logical method. In turn, as already mentioned, the historical method must without fail reveal the laws of historical development.

Classical examples of the application of the historical and logical research methods are the writings by K. Marx, "The Class Struggle in France" and "Das Kapital" respectively. The first of these writings is filled with the names of specific historical leaders of the French Revolution of 1848. This work gave an analysis of the role of each of these leaders and the operation of historical laws is represented in the form of a series of successive events in which the activity of definite classes, parties and individuals was embodied.

However, Marx was very far from being descriptive. In comparing facts and events, he points out their conformity to laws and shows how the thread of historical necessity ran through apparent random events. Marx uses any fact and event which he touches upon for substantiating the development of his theoretical points of view.

Classical examples of the application of the historical method to study of military events are given in the writings of F. Engels concerning the revolution of 1848-1849, concerning the Italian war of 1859, on the campaign of Garibaldi in 1860, on the Austro-Prussian War of 1866, on the Franco-Prussian War of 1870-1871, and in a number of other studies. In an analysis of all the described events, Engel's combined accuracy in the description of everything which happened with all its zigzags and random events with a profound theoretical analysis. The smallest detail, like the shortage of hardtack and embezzlements in the commissary department, being described in relationship to all the surrounding phenomena, is transformed into a tool for understanding actuality as it actually was and in the "flesh and blood" of specific events.

In his article entitled "The Garibaldi Movement", Engels in two short paragraphs gives a description, brilliant in its depth, of the Neapolitan army, at the same time laying bare the factors responsible for this condition in the army, and provides a lesson for practical application (15,000 troops under Garibaldi moved against 150,000 Neapolitan troops with a real chance for victory).

Such is the historical method as applied by Marx and Engels.

In "Das Kapital", in contrast to the mentioned writings, the author gave a theoretical expression of the actual historical process. This process was not set forth in the form of a description of specific events and activity of particular personalities, but by means of an exposition on the basis of generalization of real phenomena and the facts of economic wars controlling the movement and development of the actual life of capitalistic society. "Das Kapital", to be sure, also gives an analysis of the activity of people, not the movement of abstraction. "That here", Marx himself pointed out, "we are dealing with individuals only to the extent that they are a personification of economic categories, carriers of definite class attitudes and interests" [29]. In this study we do not see specific family names and first names. Here the principal individuals are "capitalists", "landowners", the "proletariat", that is, "abstract", generalized individuals. However, at the same time, in "Kapital" an enormous amount of historical material is given. Lenin himself, with every basis, pointed out that in this work there is both a theoretical and an historical analysis of capitalists.

With respect to the selection made by Marx of a logical method for exposition of political economy, Engels wrote: "History frequently proceeds in jumps and zigzags, and if it was essential to trace history in all its details, this would mean that it would be necessary to take into account much less valuable material and it would be frequently necessary to interrupt the train of thought . . . Thus, the logical method was the only fitting course." [30].

Classical examples of the investigation of military phenomena by the logical method were given in a number of works by Engels. For example, these include the chapters on the theory of violence in the second part of the book by F. Engels entitled "Anti-Dyuring" [31] and the article entitled "Mountain War Before and Now" [32].

In the mentioned chapters from "Anti-Dyuring" F. Engels lays bare the dependence of the army and navy on economic conditions from the point of view of dialectic and historical materialism and analyzes the material bases of development of the armed forces and military science. In giving theoretical solutions of these problems, Engels relies on historical experience. The sketch of the development of military art from the Middle Ages to the 1870's

presented for this purpose represents a profound generalization of the history of wars, a summarization of the most important results obtained at that time by Marxist science in this field.

The study "Possibilities and Prospects of the War Between the Holy Alliance Against France in 1852" is very instructive in the sense of the proper application of the logical method in military studies. In this study its close attention to the solution of problems arising in this field of knowledge due to the practical necessities of life is particularly instructive. Another distinguishing feature of this study is the proof given for all the conclusions, their thorough validation and the convincing arguments presented for them.

Engels did not complete this study, but that which he did write even today is an inestimable contribution to military science, particularly in methodological respects.

In 1852, when this study was written, the theory of military art was only in its infancy, and Engels developed this theory and in general scientific terms (for us this represents a lesson and an example meriting imitation). Psychological losses (without value for an old army but useful for a young one) do not have individual formulations but merge in historical laws. The latter in general have a dominating importance in this study. In the last analysis they lie at the basis of all the reasonings set forth by Engels.

In this study the law of dependence of methods of armed struggle and the development of production is for the first time deduced from history and is formulated. Here also we have a demonstration of the law of further growth of mobility and massiveness of armies and the fact that mobility can replace massiveness under certain conditions.

On the whole, this entire study, like all similar studies by Engels, is an exemplary application of the logical research method on problems of military art and is of the greatest value for us.

What we have said above demonstrates that despite all the difference between the logical and historical research methods the boundaries existing between them are arbitrary and these methods are closely related to one another. It therefore follows that the studies of military historians and researchers, like the workers in other sciences, must be free not only from empiricism, which reduces everything to the recording and describing of facts without a

revelation of their meaning and regularity, but also from an abstract logical approach which ignores the theoretical conclusions and generalizations of specific phenomena. Marxism-Leninism harmoniously combines the most systematic and sober analysis of real events by the means of the laws of science with bold theoretical generalizations relying on the hard-rock foundation of fact.

When applying any of the discussed methods, the military researcher, using the laws of dialectic logic as a basis, cannot ignore the laws of formal logic. On the contrary, these laws in the exposition of the materials obtained in the course of research, have very great importance. The laws of formal logic must be fully mastered in order to write in an understandable way, in a manner comprehensible to the reader, concisely and convincingly.

All kinds of statistical data are of great importance in the course of military research. The military researcher must be able to analyze them, sort out everything of value which favors the revelation of objective truth. However, if this is to be done the military researcher must also master the laws of such sciences as statistics.

The military researcher must know not only research methods, dialectic laws, logic, statistics, etc., but also must master a great variety of research methods. As is well known, there are substantial differences between method and procedure. Whereas a method is a combination of procedures, a procedure is only one component of a method. Research procedures are extremely varied.

The use of any research procedure must not be dependent on the inclination of the researcher. Individual research procedures must be used in accordance with the nature of the subjects being investigated.

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Chapter III

APPLICATION OF LOGIC IN MILITARY SCIENCE RESEARCH

1. Importance of Logic for Military Science Research

Logic, as a science directed to the attainment not only of formal truth, but also truthfulness in thought, as pointed out by Engels, is a method for finding new results with a transition from the known to the unknown [1].

Formal and dialectic logic can be distinguished. Dialectic logic investigates the processes of development of concepts, reasonings and deductions which are specific in their content and reveals what is common in these processes. Formal logic digresses from the specific content of these processes and reveals only their form. By comparing the forms of different thought it establishes what is common in these forms. Dialectic logic formulates the principles of a correct approach to subjects and phenomena existing in reality in the course of their development; it shows how the process of learning of specific subjects and phenomena occurs through a number of abstractions; it reveals how the processes of historical development of various phenomena are reproduced in our thought with logical correctness, etc. It investigates concepts and categories of scientific learning and instructs us on how to operate correctly with concepts in their change. However, formal logic studies the forms in which every thought exists in any degree of its development, as well as the forms of logical actions with concepts and reasonings at any stage in their development. In other words, both dialectic and formal logic study the very same process of the correct reflection of reality in thought, but they regard it from different aspects.

Concepts and reasonings as methods for the logical comprehension of military phenomena, as well as the general forms of logical actions with concepts and reasonings are completely necessary forms of our mental activity, without which the military researcher cannot manage.

The various forms of deductions which constitute procedures or methods by means of which we obtain new knowledge, studied by logic, have particularly great importance in understanding military phenomena. Engel's particularly emphasized that "even formal logic is primarily a method for seeking new results, for transition from the known to the unknown . . . " [2]

Scientists, said Engels, without thought cannot advance a single step; however, thought requires logical categories and a skill in operating with these categories is not anything congenital, but instead is formed in the process of acquisition of knowledge of logic and the application of this knowledge in practical thought.

There are individuals who speak correctly without knowing grammar; there are those who reckon rather precisely although they have never studied arithmetic; there are those who play musical instruments fairly well without having concepts of the theory of music. Similarly, there are individuals who correctly connect thoughts in reasoning without knowing logic, proceeding solely on the basis of life experience, on the experience gained in their practical activity.

Nevertheless, without a profound knowledge of grammar it is impossible to use the verbal richness of the language with perfection and correctly; without a knowledge of arithmetic we cannot use the simplest procedures in computation; without studying the theory of music it is impossible to become a true musician. Similarly, without a knowledge of logic it is impossible to make perfect deductions and reasonings or conduct a scientific study. Accordingly, logic is a sort of grammar of logical thought.

By application of logic man is able to structure his thoughts, deductions, reasonings, hypotheses and proofs correctly. However, from this alone it cannot be concluded that a knowledge of formal logic alone, in short all the conditions for correct and scientifically sound thought. On the contrary, many attempts which have been made in the past to conduct research relying on the laws of formal logic have led only to scholasticism, to an empty and fruitless theorizing, detached from life and from life's experience. The experience of the past convincingly demonstrates that all those methods and forms of thought which are considered by formal logic can be usefully applied in scientific research only by those who have mastered the skill of applying the laws of dialectics and have adequate knowledge of the investigated problem.

Logically correct thought occurs in definite forms; it is characterized by definite patterns, a knowledge of which safeguards the researcher from the incorrect thought, that is, from illogical, undemonstrable and contradictory thought. Formal logic provides methodological procedures favoring a better, more complete investigation of various military phenomena and a convincing and clear exposition of the points brought out in the course of research.

Logic can aid the Soviet military researcher in unmasking what are known to be the spurious reasonings of bourgeois military theoreticians and to demonstrate the antiscientific charcter of their military theories. Logic is a powerful weapon against every kind of sophistry in military studies. The classics of Marxism-Leninism provided us with brilliant examples of the masterly use of this weapon against ideological and political enemies of the working class. This weapon is also used with great success in our studies in military theory and military history against the sophistry of military ideologists of present-day imperialism and all those who depart from the truth, who strive to substitute falsehood for the objective truth.

In work in the field of military science it happens that in addition to correct procedures of thought some people apply methods which are invalid, inadequately reliable, based on superficial and sometimes even random relationships between military subjects and phenomena. For example, there is an erroneous form of deduction when a simple sequence of phenomena is used as a basis for concluding that they have a causal relationship. In a number of cases the analogy is incorrectly used, when for some thoroughly random similarity between two military phenomena with respect to some criteria it is concluded that they are similar in other respects as well.

The proper application of logic helps in explaining under what conditions the employed procedures yield true results and in what cases they can lead to losing the way; it helps in clarifying those relationships between subjects and phenomena in military art in which the procedures always are legitimate and it establishes what additional data or conditions are necessary in order that they will always lead to true results.

The application of logic yields knowledge without which it is impossible to conduct a military science study. Logic teaches how to consciously master thought procedures, analyze reasonings in a logical thought structure, precisely comprehend another's thought and attain accuracy in one's own reasonings. Logic makes it possible to deal effectively in different ways with concepts, forms of deduction, methods for presenting proof and refutation, that is, with all those means which insure the military researcher a rigorous soundness of his conclusions, that they will be absolutely convincing and thoroughly substantiated.

In everyday practice it is common to encounter a situation when a military researcher sets forth what in essence is completely true findings but he cannot express them with adequate precision and fails to find a logical form for them. Not being a master of the procedures of proof, he is not able to substantiate his conclusions rigorously and convincingly and frequently tries to base his conclusions on facts from which they in reality do not follow.

In attempting to refute any spurious points of view, he cannot reveal the errors in the opponent's reasonings and is unable to demonstrate the falseness of the points against which he is writing, limiting himself solely to unsubstantiated assertions that they do not correspond to reality, etc.

It is as necessary for the military scientific worker to know and to be able to use the basic outline of logic in military research as it is necessary to know grammar in order to set forth his thoughts on paper in a literate way.

The work of the military researcher will be productive only if the study is made with profound scientific and theoretical thought, when the researcher, by means of comparison of facts concerning military phenomena, by means of generalizations, etc., draws conclusions concerning not only what is directly perceived, but also concerning that which cannot be directly perceived.

Military theory, particularly during peacetime, would fall into decay if military researchers did not make use of logical argumentation. The importance of application of logic in this case is that the truthfulness of any point can be demonstrated in a purely logical way by using other true points, but in this case the researcher must correctly use fundamental procedures and forms of thought. The overwhelming majority of rules and standards in military art are established directly from practical experience. However, by no means is it always possible to check the practical during peacetime. For example, it is impossible to check the effect of an atomic explosion on man. In such cases, logic, its methods of comparison, analysis and synthesis, abstraction and generalization can be of great assistance to the military researcher.

The application and use of logical forms and laws never will be mutual. It either favors the correct materialistic solution of the examined problems or else it serves as one of the means for validating antiscientific idealistic points of view.

Logical forms and laws are necessary components of human thought. Whenever the thought of the military researcher correctly reflects military reality, he consciously or unconsciously is guided by the laws in forms of logical thought.

It therefore follows how extremely important it is to apply logic in a military science study. If the military researcher has a good mastery of logic and is capable of dialectic thought his reasonings will be irrefutable.

It therefore follows that for the study of phenomena in war and military art it is necessary to know both the Marxist dialectic method and logic. Logic and dialectics are intimately related to one another and cannot exist separately. A study of any military phenomenon solely from the point of view of logical laws, procedures and rules, without the dialectic revelation of the internal relationships of the phenomenon of which it consists, without relationship to other phenomena, cannot be understood and does not yield positive results. Only the use of the dialectic method in combination with logic in military science research will lead to the attainment of a definite scientific result.

2. Laws of Logic and Their Application in a Military Science Study

Lenin stated "the laws of logic are a reflection of the objective in the subjective consciousness of man" [3].

Science has long known four laws of logic: the law of identity, the law of contradiction, the law of the exception and the law of an adequate basis.

The law of identity is a reflection of the fact that phenomena in nature and society exist in a relatively fixed form for a definite period of time during which the same content must persist in our deductions concerning them. The problem of the law of identity is directly related to the problem of identification and discrimination of thought. Whereas definiteness of thought is governed by definiteness of the object of thought, thoughts are identified and discriminated solely in relation to their subjects and content. For example, if a military researcher has written in one place that "the attack of the enemy front with infantry and tanks begins at the time when the artillery preparation for the attack ends", he has every right to describe the same phenomenon in another place as follows: "as soon as the artillery preparation

for an attack ends, the attack of the enemy front with infantry and tanks begins". It is entirely obvious that these two thoughts are identical in their content although different in form.

For example, if it was demonstrated that a definite distribution of forces is required in order to reduce losses when new means of armed combat are employed on the field of battle, no matter how many times the researcher returns to a demonstration of this point and regardless of how many systems of proofs are used in the sense of a combination of physical and physic processes differing from one another with respect to locality, time and subjective properties, the proofs remain identical if a definite combination of truths and points is used in all these proofs.

On the other hand, if the content of the researcher's thought changes or is applied to a different subject, if the makeup of the thought is changed, by virtue of the law of identity the thought cannot be regarded as the same thought and must be considered a different one.

In a number of military studies one finds a violation of the law of identity. This violation is not in a switching from one subject of thought to another or in a change in the content of the thought, which inevitably occurs during the course of research, but in a mixing of thoughts, in the use of words which do not quite coincide although close in meaning for thoughts with the very same content (for example, the use of the following words as synonyms; "retire", "retreat"; "order", "directive"; "command", "instructions"; "battle", "combat", etc.) or words which have an identical sound but are different in meaning ("otkhod" in the sense of retreat and "otkhod" in the sense of departure from a decision), mixing of collective and partitive meanings of a term, abstract and specific sense of terms.

The identification of thoughts different in content leads to errors in deductions, in proofs and refutations.

The violation of the law of identity by the use of the very same thought for different ideas, whether as a result of different word expressions or expressions of the same thought by a scheme identical to it in the employment of words gives rise to an error which is known as "anticipation of reason". In this case the author uses as an argument a point which in reality should

be demonstrated in order for his thesis to be considered proven. In this case researchers erroneously feel that this point is different from the thesis. It also happens that authors use as an argument a point which can be regarded as true only if the thesis itself is true.

For example, a researcher formulated as his objective the demonstration of the time required for the elimination of targets during a period of artillery preparation for attack and began the proof by citing a table showing the time indicated in the corresponding Instructions for the elimination of each of the group of targets which had to be annihilated and on this basis computed the average time for destroying targets, such as 20 minutes, and on the basis of this result he wrote: "the table shows that the average time required for destroying targets during artillery preparation is 20 minutes".

It is entirely clear that this conclusion is a typical example of a logical error known as "anticipation of reason" because as the basis of proof the author used precisely that which had to be demonstrated.

This example shows that the law of identity in many cases can be violated unconsciously. However, very frequently this law is also violated intentionally. This happens in cases when the author desires to distort the true situation. For example, bourgeois military leaders, in order to hide their preparations for war, call the military alliances which they establish "defensive" and go to any lengths in writing about the objectives of these alliances in an unclear and obscure way.

The violation of the law of identity when employing the same thought for different ideas creates an apparent gap in the logical relationship between thoughts, obscures the inconsistency in reasoning and in the theories of bourgeois military leaders first as a means for evasion from a logically inevitable conclusion if for some reason this conclusion does not suit them.

The law of contradiction reflects the objective circumstance that two opposite thoughts concerning the same subject or phenomenon cannot be both true and false at the same time and in the same respect: one of them is true and the other is false. "Logical contradiction, of course, under the condition of correct logical thought, must not exist either in economic or in political analysis" [4].

In actual practice the requirement for adhering to the "law of contradiction" in a military study means that the researcher cannot answer the same problem at the same time in the same sense both affirmatively and negatively. For example, a military researcher proceeds incorrectly if in discussing a regimental artillery group he writes in one place in his study that this group plays a very important role in the course of battle, but in another place writes that during the course of the battle its units were transferred to the battalions and the group essentially existed.

The dialectics of development of military phenomena, as is well known, is always extremely contradictory, but by no means does it follow from this that an author can allow confusion and contradiction in thought concerning a very specific phenomenon or in the description of phenomena.

Sequence is one of the most important properties of proper thought. The military researcher must firmly adhere to sequence in the interpretation of any problem, not allow contradictions in thought in his research, not jump from one definition of a subject to another, and not allow expressions which have double meanings, are indefinite or inexact.

What we have said does not mean, however, that the law of identity requires an identity of the thought in itself in all cases, regardless of change in time and conditions. Conditions change and the object of our thought also changes. Let's take such a term as "artillery preparation for an attack" during the First World War, during the Second World War and now. Artillery preparations for an attack have changed not only with respect to the number and quality of weapons participating in it, but also in the missions and in the depth of effective fire power. Naturally, such changes in the object of thought give rise in military theory to a need to reexamine various established principles. This change in concept arising due to actually existing contradictions is one of the aspects of finding something new in the investigated problem. Aristotle who for the first time gave a logical formulation of the law of contradiction, stated that it was the most reliable of all the principles valid for everything in existence.

The law of contradiction includes a rule safeguarding one against the assumption of "artificial" and "philological" contradictions. The thought of the military researcher is thereby directed to the proper representation of phenomena in military art.

There are two types of logical contradiction, intentional and unintentional. Intentional logical contradictions are frequently encountered in the writings of bourgeois military leaders, particularly in studies on military history. For example, in his study entitled "The History of the Second World War" the German General K. Tippelskirch, in contradiction to the logic of the facts, is forced to demonstrate that the reason for the defeat of Germany in the war was incorrect strategic guidance of the war by Hitler.

Among our military researchers it is most common to encounter unintentional errors in logical contradiction. For example, in order to demonstrate any thesis, a researcher makes a special selection of examples from the experience of war for "confirming" his thesis. However, the thesis itself is artificial, it does not follow from the logic of things and the logic of things is always stronger than human logic. As a result, the conclusions contradict the truth.

A knowledge of the law of contradiction and its intelligent application helps in clarifying the existence of logical inconsistency in the writings of bourgeois military leaders. At the same time, it assists our military researcher in presenting his arguments and expounding his thoughts in sequence and in an objective way.

The law of the exception reflects the objective circumstance that two judgments cannot be false at the same time if in one of them something is asserted about an object or phenomenon, whereas in the other the very same thing is denied concerning this object or phenomenon: one of them must be false and the other true.

The law of the exception, like the law of contradiction is a law of the relation to one another of assertion and denial of one and the same thing about one and the same phenomenon or object. However, their fields of application are not identical. The law of contradiction is more general than the law of the exception because all judgments conforming to the latter of the mentioned laws also conform to the law of contradiction, but by no means do all judgments conforming to the law of contradiction conform to the law of the exception.

Examples of such judgments are: "any battle leads to victory" and "not one battle leads to victory"; these conform to the law of contradiction, but not to the law of the exception. One of them is not necessarily true, because both of them can be false.

The law of the exception is of great importance in military science research. It is the basis for a number of deductions and is the basis for indirect proofs.

For example, assume that a researcher came across the following judgment: "if a tank is hit directly by a 122-mm shell, the tank is knocked out", and another: "with a direct hit of a 122-mm shell on the tank the tank was not knocked out of action". After comparing these statements with the knowledge that the direct hit of a 122-mm shell always knocks a tank out of action, it can be concluded that the first judgment is true and the second is false.

When using indirect proofs the researcher assumes to be true a point which contradicts the thesis being demonstrated and in the course of his demonstration arrives at a contradiction with judgments whose truths have been established. Thus, the falseness of the point contradicting the thesis is established and a conclusion is drawn as to the truths of the thesis being demonstrated on the basis of the law of the exception.

For example, the military researcher knows that when repulsing an enemy tank attack the ratio of losses of tanks and guns was one to one. Assuming to be true the determined losses of tanks, the researcher computed the losses of his weapons. The number of destroyed tanks and the number of lost weapons coincided. This means that the conclusion concerning the losses of enemy tanks was correct.

In reasonings and exposition of material errors are encountered which can be eliminated only with the proper use of the law of the exception. The most common errors are errors when one of the points asserts something concerning a single object or phenomenon whereas another point denies the very same thing with respect to the same object or phenomenon considered at the very same time and in the very same respect. Such points in most cases do not stand side by side in the text and therefore are discovered only in an attentive examination of the written material.

For example, if the author asserts in one place that a modern defense must be an antitank defense and that for this reason there is no need of an appropriate form of combat support and that the antitank defense is transformed into the basic type of defense, whereas in another place antitank defense is regarded as a type of combat support, it is entirely obvious that these two judgments are

logically contradictory and cannot simultaneously be true or simultaneously false. On of them is true and the other is false.

Another error of this type is when something is asserted concerning an entire class of objects or phenomena but is denied with respect to some of the objects or phenomena of the same class. For example, if it is demonstrated in one place in the study that great ranges are not required for the combat artillery, but that only a high maneuverability is required, so that it must be of a low weight, self-propelled, mobile and highly movable, whereas in another place in this same study and in a different connection it is demonstrated that it is desirable to include heavy systems with a long range in the divisional artillery, it is entirely obvious that one of these judgments is certainly false, the other is true, and that there is no third possibility.

The law of the exception expresses an important requirement on our reasonings: in every case when there is no middle ground between an assertion and a denial of the same point, the ambiguity must be eliminated and it must be determined which of these assertions is true and which is false. If it is established that a particular judgment is false, it follows logically from this that the judgment contradicting it is true; vice versa, if it is established that a particular judgment is true, the judgment contradicting it must be false.

A knowledge of the law of the exception helps the military researcher not only in detecting logical absurdities in studies which he reviews and in finding true points in the course of his own research, but also enables him to avoid many errors in the exposition of material.

The law of the exception requires that the military researcher take fundamental positions on any problem. It is always necessary to choose from two points which contradict one another and the choice which is made clearly indicates the scientific maturity of the particular researcher.

The law of adequate basis reflects the objective circumstance that any correct concept must be based on other sound concepts whose truth has been demonstrated; in other words, for any point to be considered completely demonstrated there must be adequate supporting facts by virtue of which it is considered true.

The requirement that ideas be well founded reflects one of the fundamental properties of the material world. In nature and society every fact, every object and every phenomenon, including a military phenomenon, are governed by preceding facts, objects and phenomena. No military phenomenon can appear if there has been no earlier preparation, if it does not have roots in earlier phenomena. Accordingly, in order to demonstrate the inevitability of the appearance of anything new in military art one must discover the factors giving rise to this new phenomenon and establish significant relationships between cause and effect.

In military art objects and phenomena are related in such a way that frequently the knowledge of one of them can be a basis for a knowledge of another. For example, a knowledge of characteristic indicators of enemy preparation for an attack makes it possible to draw not only the conclusion that the enemy has begun to prepare an attack but also concerning the possible time of its beginning and the direction of the main thrust.

The military researcher, in order to demonstrate the point which he presents must give proofs. Only truths and the relationship of truths can be the basis for truthfulness. Only such truths or such relationship of truths can serve as an adequate basis when nothing above and beyond this is required for demonstration. We refer to necessary truthfulness, not possible truthfulness, not reliability, not probability.

Other concepts can also be the basis for recognition of a concept as being true or logically sound. In order for these concepts to have an adequate basis they must satisfy two conditions: first, a wellfounded thought must follow from them by necessity, since otherwise the validated concept can be only considered possibly true; second, concepts used as a basis of proof must correspond to reality because if they are false, the concept which of necessity follows from them can also be false.

The law of adequate basis requires that our concepts in any reasoning be internally related to one another, follow from one another and validate one another. The new military researcher in many cases violates this point in the law of adequate basis. His thoughts jump from one problem to another and there is no sequence in exposition. This naturally makes it difficult to read and comprehend his study.

However, it does not follow from what we have said that by virtue of the law of adequate basis all points, other than those known to be true, must be considered false. On the contrary, by virtue of this law, an adequate basis is also required for the recognition of the falseness of any point.

Points not recognized as being actually true or actually false must be considered, if they do not in any way contradict the truth, only as being possibly true or possibly false because if there is an inadequate basis for them they can be regarded as guesses, hypotheses, preliminary generalizations, etc., depending on the degree of their correspondence to reality. However, then they all must be subjected to further checking in conformity to the law of adequate basis and thereafter one of them can be accepted and those not having any basis can be rejected.

In order to determine the truth the military researcher checks his facts against the archival materials and reports by witnesses and analyzes the reliability of the facts. "Certainly, this is not always easy to do. It is far 'easier' to take on faith what one comes upon, that which one chances to hear, that which is more 'openly' proclaimed, etc. However, people who are satisfied with this can be called 'slackers', people without a well developed integrity, and no one need take them into serious account" [5]. The incorporation of unchecked or false facts in the validation of their points has always led to incorrect conclusions and unconvincing exposition.

Knowledge and practical usage of the law of sufficient basis allows the military investigator to avoid a number of errors in his material, and to make his scientific work clear and convincing.

3. Fundamental Logical Methods and Forms of Comprehension of Military Phenomena.

The fundamental logical methods by which military phenomena are comprehended in the thought process are comparison of military facts and events, their analysis and synthesis, abstraction and generalization.

Facts and events, their relationships and interrelationships, are reflected in thought in the form of judgments and concepts. By comparing and relating the resulting judgments and concepts, the military researcher derives new judgments and concepts which contain new knowledge concerning military objects and phenomena. Such operations with judgments and concepts are expressed in the form of deduction. Judgment, concept and deduction are the fundamental logical forms of thought.

Every logical method and every form of thought has its rules which must be observed by the military or any other researcher.

The essence of military phenomena and their laws and patterns are comprehended by the researcher as a result of thought based on his definite theoretical and practical knowledge and his ideas concerning the investigated phenomena. The military researcher compares, breaks down and connects the individual special facts known to him concerning a battle, operation or war or their characteristics, analyzes and reanalyzes all these facts by making use of definite logical methods.

Things and phenomena are comprehended primarily by means of comparison. The great Russian teacher K. D. Ushinskiy wrote that if we want any object in the environment to be understood clearly we must discriminate it from the objects most similar to it and find in it a similarity to the objects most unrelated to it; only then is it possible to determine clearly the significant criteria for the object and this means to understand it [6]. There is no other approach for understanding objects in the environment. The same can be said of military objects and phenomena.

Comparison in military science research is nothing more than determining the similarity and difference of objects and phenomena of military nature.

Marks demonstrated that the sciences " . . . attained great successes only as a result of comparison and determining differences in the sphere of comparison . . . " [7]; for modern science " . . . comparison assumes a vital role . . . " [8].

The comparison method is an extremely widely used scientific basis serving for comprehending many phenomena. Comparison can be used for achieving two different goals: for determining general laws or for obtaining historical information. Both types of comparison are completely valid but extremely different.

Comparison is used as a logical method by a researcher from the very beginning of his work. As a result of comparison of several military objects or phenomena it is possible to establish their general properties and criteria and thus determine the general characteristics of the investigated class of objects or phenomena. New findings in military phenomena come about only as a result of comparison of characteristic criteria of the investigated phenomena.

Proper conclusions can be obtained as a result of comparison only when observing a number of necessary conditions.

First, it is only possible to compare those concepts which reflect objects and phenomena of a military nature which are related to one another. It is entirely valid to compare the concept of "attack" at the time of the First World War and during the Great Fatherland War. However, comparison of such concepts as "combat" and "march", "forcing of a river" and "landing of an amphibious force" is not only unscientific, but is also virtually useless. Despite this, errors in comparison of concepts which cannot be compared are unfortunately still encountered in the writings of some military researchers.

Second, objects and phenomena must be compared with respect to criteria which are of great and important significance. For example, the difference in the nature of a number of operations cannot be clarified from such a criterion as the amount of ammunition expended in each of them because this does not determine the resoluteness, the depth, the tempo or other principal characteristics of the compared operations. Such a comparison can even impel the researcher to draw erroneous conclusions because it may be that in the operation where a lesser expenditure of ammunition occurred better results were obtained than in operations where there was a greater expenditure of ammunition.

With all its positive aspects as a form of thought, capable of establishing an objective truth when investigating any particular problem, comparison nevertheless cannot serve as the principal and certainly not the only logical method for understanding a phenomenon. Comparison reveals only certain aspects of the compared objects or phenomena and temporarily and arbitrarily ignores other aspects. Accordingly, this logical method does not exhaust the entire idea concerning the investigated object or phenomenon. A clearer understanding of military phenomena can be obtained by comprehending the part of the whole, by an examination of each of them individually. Such a logical method, that is, the mental breakdown of the investigated object or phenomenon into its component parts and the investigation of each of them separately as part of a whole is known as analysis.

Analysis is a very important logical method. Complex military phenomena cannot be comprehended without this. For example, for understanding such a

complex phenomenon as combat it must be broken down into parts and each of these parts studied. Only as a result of such a breakdown can the combat be understood and its means and objectives evaluated. Naturally, the military researcher will always be faced with a problem concerning which there are many data for his comprehension. However, as a result of analysis the picture becomes clearer and clearer and a sounder conclusion can be drawn. For example, the investigation of any combat provides for the study of the enemy, his forces, their organization, the terrain, operation methods and other data.

The dialectic movement of thought from the specific, available to us in an unsystematic form, to a specific form in a rigorous system, proceeds through the analysis process. However, it must be remembered that not every analysis of an investigated phenomenon can lead to proper conclusions. One of the most frequently encountered errors in analysis is that the breakdown of the phenomenon is done abstractly, in a set form, not taking into account the conditions under which a particular phenomenon transpired. For example, nothing is obtained, if we may say so, from an analysis of a suddenly occurring meeting engagement when this combat is broken down into such parts as the making of decisions, formulation of objectives, occupation of initial position, actual beginning of attack, etc. Obviously, in this case it is most important to determine the conditions under which this engagement arose, the position occupied by the sides at a particular time, the nature of the operations (initiative, resoluteness, wavering) of the military units which first came into contact, how the senior commanders and staffs understood the conditions, what events occurred as a result of their understanding, etc.

In analyzing any phenomenon it must be remembered that proper analysis cannot be reduced to a mere breakdown of the phenomenon into its component parts. A comprehension of these parts must be followed by an understanding of the phenomenon as a whole.

A knowledge of parts of an object or phenomenon is still not a knowledge of the object or phenomenon as a whole. In order to study a tank or aircraft it is certainly necessary to become familiar with their parts. However, for a full and thorough understanding of the importance and role of each part of the combat vehicle, the analysis process alone is not adequate. The component parts of the objects and phenomena must be comprehended in their interrelationship and in their unity. For example, it is impossible to limit oneself to an

examination of the decisions to engage in combat by parts (initial intention and missions assigned to subordinates); it is also necessary to understand the decision as a whole during the course of its implementation, that is, to think out all the problems involved in interactions.

Very frequently in the course of analysis it is necessary that very simple components be combined into similar groups and then, as a result of an examination of these groups, draw a conclusion concerning the essence of the phenomenon. Analysis must begin without fail with the simpler considerations and must then proceed to more complex considerations. An abstract approach to analysis, in which individual facts concerning some phenomenon are examined without regard to other facts concerning this phenomenon, never leads to the truth.

The mental integration of the parts of an object or phenomenon broken down in the analysis process, determination of their interrelationship and a comprehension of the object or phenomenon as an integral whole is called synthesis.

Synthesis is not a simple sum of parts. A tank which has been broken down into parts can be restored only if these parts are corrected in a definite order interrelated to one another. If the connections between the parts are broken one can obtain a pile of metal instead of a tank as a military vehicle. During the synthesis process it is essential to establish the interrelationship of the parts to the whole.

Analysis and synthesis are a reflection of the most general laws of comprehension of objective reality and arise as a result of the influence of the external material world in which disintegration and integration are constantly transpiring processes. Since disintegration and integration in nature and society constitute a uniform process, so also must logical analysis and synthesis be inseparably related in the thought. F. Engel pointed out that thought consists equally of the breakdown of objects into their elements and in the integration of related elements into an entity and that without analysis there is not synthesis.

Analysis must end with a mental reproduction of the studied object or phenomenon in all the variety of its properties (characteristics) and relationships. In order to make a real study of a phenomenon it is necessary to show

all its characteristic features, all the relationships of the individual facts in the phenomenon and trace their relationship to other phenomena.

Analysis and synthesis, although very important methods in logical thought, cannot give a positive result if the individual properties of the object are investigated. In actuality, whatever phenomenon we investigate, it is not necessary to study or comprehend each and every one of its properties (characteristics). Experience shows that for a true comprehension of a phenomenon it is necessary to reveal the useful and significant properties and separate them from random properties, that is, abstract them from the useless and unimportant properties. For example, if the problem is to study the long-range capabilities of artillery weapons, attention is given only to this property of the weapons and all other properties are abstracted. If the problem is to study the rate of attack or, for example, the stability of a defense, all the other properties (characteristics) of attack or defense (respectively) are analyzed only to the degree that they are necessary for clarifying the investigated property.

All our knowledge concerning objects and phenomena is the result of abstraction of thought from the unimportant and on this basis a comprehension of what is important and significant. The mental separation of important criteria and properties of a specific object or phenomenon and their mental abstraction from a great many unimportant criteria, properties and relationships of this object or phenomenon is in fact called abstraction.

Abstraction is of exceptionally great importance in the forming of concepts when it is necessary to separate important criteria of an object and phenomenon or a group of objects and phenomena. The result of the abstraction process is called an abstraction.

In a study of the phenomena of war and military art it is impossible to use everyday experience because the only true and valid experience is war. During peacetime all our ideas concerning war must come from abstraction. In the natural sciences abstraction is possible in pure form. For example, chemists can take elements in pure form and study them in a vacuum, thereby abstracting them from the ambient medium, whereas abstraction in the social sciences, including military science, is possible only by mental abstraction, assuming only one investigated phenomenon to be important and the others being

left aside temporarily until the final study of the properties of the considered phenomenon.

Thus, for clarifying the absence of the interaction between infantry and tanks one temporarily abstracts the fact that both tanks and infantry are supported by the fire of accompanying guns, artillery and mortar fire from concealed positions, that they interact with combat engineers, etc. Abstraction is also important because after abstraction thought returns to a specific object, but no longer in its former form, but in an enriched form. Any true scientific abstraction reflects in logical form the content of both objects and phenomena. V. I. Lenin wrote: "Thought, ascending from the specific to the abstract, does not depart -- if it is <u>true</u> . . . from the truth, but approaches it. Abstraction of <u>matter</u> or a <u>law</u> of nature, the abstraction of <u>cost</u>, etc., in short, <u>all</u> scientific (true, serious, not nonsense) abstractions reflect nature deeper, more truly, <u>more completely</u>. From living contemplation to abstract thought and <u>from it to practical work</u>, this is the dialectic approach to learning the <u>truth</u>, a comprehension of objective reality" [9].

The comprehension of military phenomena in the course of abstraction will be deeper and more thorough only when they are examined inseparably from surrounding conditions in which they transpire. Among the great variety of forms of relationship existing in reality there is certainly some one most general form of relationship which permeates the examined military phenomenon from beginning to end.

Thus, general patterns are revealed in individual military phenomena. The general conclusions drawn as a result of this knowledge are again applied to an individual and isolated object or phenomenon. As a result, one can predict how some type of weapon or military equipment will change or how armed combat will occur in the future under new conditions.

This logical method, by means of which there is mental separation of some general distinguishing features characteristic of only a particular class of objects or phenomena and the formulation of a conclusion which is applied to each individual object or phenomenon of this class is called generalization.

In the generalization process the military researcher must sweep aside a mass of details associated with the military phenomenon. By recognizing the general, this makes it possible to penetrate more deeply into the heart of the

investigated phenomenon. Sometimes when a single simple object or phenomenon is involved a single important criterion will be adequate. However, in most cases the military researcher must draw conclusions concerning a wide range of different types of weapons and military equipment used on the battle field or a number of battles and operations. In such cases the problem is more complex. First it is necessary to determine and abstract the important criteria for each type of weapon and military equipment for each battle and operation of the corresponding type. Then from among these significant criteria one must select only those which are common for all the examined type of weapons and combat equipment and the type of battle and operation, that is, there must be mental generalization of the criteria.

Thus, in order to determine the general, such as in the examination of four or five attack operations on the basis of such criteria as the time for preparation of the operation, duration, tempo of the attack or scale of the operation, the researcher examines each of these criteria in each operation and then mentally generalizes them.

Generalization is of very great importance not only in research, but also during the preparation of a final plan or prospectus, summaries of reports, scientific communications, etc.

The ability for generalization, like the ability for abstraction, is intimately related to practical work. The military researcher who is systematically involved in scientific research and creative work can quickly grasp the essence of a studied military phenomenon and draw generalizing conclusions. A military researcher involved in creative work only from time to time will always experience difficulties in generalizing the content of various studied military phenomena.

Generalizations can be both correct and incorrect. They will have a scientific character only when they are based on facts. In general, it is impossible to make correct generalizations without a knowledge of the actual facts. Generalization is correct only in cases when it is based on a comprehension of what is common in the military objects and phenomena themselves. Failure to adhere to this condition frequently leads the researcher to logical errors.

For example, if instead of a profound study of the causes of high speeds of attack by our troops in some operation or battle there is only a superficial

familiarization with the course of the operation or battle, in the generalization of the true reasons the investigator can commit errors and can propose unimportant and secondary factors as being the reason for such occurrences.

We have examined the most important logical methods by which thought is formed concerning studied military objects and phenomena. This thought can be expressed in the form of a concept or judgment. Logically correct thought occurs in definite forms and it is characterized by definite patterns; knowledge of these forms and patterns safeguards the military researcher against inconsistent, confused and contradictory thought and exposition. It contains systematic procedures enabling the researcher to better study military phenomena.

A concept is a thought concerning an object (phenomenon) examined from the point of view of its important criteria or a thought concerning an entire class of objects (phenomena), examined from the point of view of their common significant criteria.

Important criteria of military objects and phenomena are those criteria which, all other conditions being equal, are quite essential for them and without which they could not exist. These criteria express the essential nature of the military object or phenomena and distinguish it from other objects or phenomena. For example, the hitting of the enemy with fire power, combined with a vigorous movement toward him for his destruction in close combat, are essential criteria of an attack. Without these criteria no attack exists.

Although a concept usually forms part of a judgment, in actual thought a concept is also encountered outside a judgment, as an individual thought, especially in scientific thought. For example, scientific concepts of types of battle, types of forces, organizational units of different types of forces, methods for combat operations of troops, etc., are a definite result of study of these phenomena in some stage of development of military thought.

Thus, in logical thought the concept plays a double role. On the one hand it assists us in understanding a judgment and on the other hand it reflects in the thought a more or less full result, the sum of knowledge. A concept as a result of comprehension exceeds the framework of formal logic; it is explained from the point of view of dialectic logic.

The errors of concepts are words and terms, as well as entire groups of words. When making a study in military science care must be taken that the words and terms expressing different concepts are used in a particular reasoning in the very same sense on every occasion.

Any concept has two logical characteristics: content and scope.

The important criteria of an object or phenomenon embodied in a concept constitute the content of the concept. For example, the content of the concept "combat" will be the important criteria of combat formulated in the researcher's head.

The scope of a concept means the entire sum or totality of those objects and phenomena which can be taken in by means of this concept. For example, the scope of the concept "combat" takes in any combat, be it offensive, defensive, aerial or naval, etc.

Content and scope of a concept cannot be regarded as true isolated and unrelated aspects. An increase in the content of a concept results in a decrease in the scope of the concept and vice versa, a decrease in the content of the concept causes an increase in its scope.

For example, the scope of the concept "artillery" includes all types of artillery weapons: guns, howitzers, mortars, trench mortars, etc. The content of this concept includes important criteria common for all these types. Now we will take the concept "gun". It will be a concept with a lesser scope than the concept "artillery" because it does not take in all types of artillery, but only one. However, the content of this concept has increased due to criteria not taken in under the concept "artillery".

Military art is developing at the present time with extraordinary rapidity; some concepts are becoming outdated and new concepts are appearing. A military researcher must be able to formulate a concept clearly and distinctly because the success of his research is frequently dependent on this. For example, the unclearly formulated concept "combat in an encirclement" can mean that the study will proceed along an incorrect path. Let's assume that the researcher decided that "combat in an incirclement" is combat in which "the involved forces are isolated from the forces waging combat on an external front". On the basis of this definition, combat in an encirclement must include all partisan operations, dropping of parachute troops, and all other military

activity of units and subunits in the enemy rear, whereas the concept "combat in an encirclement" means a situation of forces when they are isolated from the forces waging combat on an external front, on land or on sea, and a continuous enemy front has been headed around their groups.

Thus, the definition of a concept is a logical operation in which the content of the concept is revealed, that is, the significant distinguishing criteria of objects and phenomena expressed in this concept are indicated. V. I. Lenin asked: "What does it mean to give a 'definition'? This means primarily to subordinate a particular concept to another broader concept. [10].

For example, the concept "second echelon" (support echelon) is defined as a combat formation or the operational structure of forces intended for augmenting the strength of an assault during the course of an attack, for increasing stability and activity in defense. Here it is subordinate to the broader concept of combat formation or operational structure of forces and the term distinguishes it from other types of combat formation and operational structure of forces. Such a definition of a concept in logic is known as the definition of a concept through immediate association and specific difference. In addition to such a definition of a concept, it is common to use a so-called genetic definition in which the origin of an object (phenomenon) is indicated, the concept is defined by the researcher and the method by which the particular (phenomenon) is created is indicated. Such concepts are "projectory of a shell", "aircraft (ship) course", etc.

Military researchers frequently use unclear definitions when the object or phenomenon is not determined through its distinguishing properties by indicating its relation to other objects or phenomena. For example, the Visla-Oder operation was the deepest of all the operations during the Great Fatherland War. However, it should be noted that such a definition is not scientific although it can be used for defining the object and phenomenon from the entire group of objects and phenomena.

Experience shows that serious errors sometimes arise in the definition of concepts. Sometimes an effort is made to list the greatest possible number of criteria for an object or phenomenon whose concept must be established. A military researcher must always remember that any object and any military

phenomenon has an infinite number of criteria to fit, therefore, this procedure frequently fails to bring the researcher closer to the defined concept and instead leads him away from it.

Sometimes definitions are encountered from which one cannot get a clear idea of the defined concept due to the excessively broad defining concept. For example, "an engagement is combat between two sides". It is easy to see that this definition is too broad and it cannot be regarded as correct because combat, operation, war and even scientific dispute are also forms of struggle between two sides. The opposite is also observed: definitions are excessively restrictive. For example, if military art is defined as a part of military science concerned with the study of strategy, its definition will be narrow, incomplete, and therefore incorrect.

In addition to the mentioned errors, some military researchers permit an error known as tautology, the definition of an object or phenomenon through itself by means of a change, and a very insignificant one, simply in the vocabulary used in the expression. For example, if the researcher writes: "the types of combat are the types of combat operations of forces", it is completely obvious that he has committed an error in the definition because it contains none of the distinguishing characteristics of the types of combat, that is, purposes and methods for the operation of forces. An error close to this is the error called "circular reasoning".

It can be concluded from what we have said that definition is one of the most important logical operations in which the military researcher must constantly be involved and that the success of his research will be dependent to a great extent on how well he masters this ability. Proper determination of an object or phenomenon means that there is a proper understanding of it.

The ability of a researcher to reason plays an important role in military science research.

Judgment is a form of thought in which the presence or absence of some criteria and relationships in an object or phenomenon is reflected. To think means to judge about an object (phenomenon). Judgment is unified, integrated thought concerning an object or phenomenon (phenomena) and its characteristics and criteria.

Judgments are formed as information is received about an object or phenomenon. In learning about a military reality, the researcher defines the properties and qualities of military objects and the characteristics and criteria of military phenomena.

In military science studies the object of judgment may be any military object (weapon, combat equipment, etc.) and any military phenomenon (combat, movement of forces, etc.) or other object or phenomenon directly related to it, any reflection of these objects and phenomena and any expression of thought in language.

Judgment always asserts or denies something concerning objects and phenomena. For example, in the judgment "aviation was used in war for the first time in 1911" it is asserted that aviation was used in war for the first time specifically in 1911. In the judgment "Soviet tanks were not armed with howitzers" there is a denial that Soviet tanks are armed with howitzers.

Judgments can be both true and false. It goes without saying that the military researcher must be able to distinguish true judgments from false ones. The determination of the truth or falseness of a judgment requires from the researcher a profound and specific knowledge of his subject.

The external form of judgment is a grammatical clause. In the Russian language this external form is characterized by a great variety and requires from the military researcher that he be a master of the Russian language.

In a judgment the researcher does not simply assert or deny any particular fact or military event; he strives to recognize what is general and important.

In reflecting the relationships and correlations of objects and phenomena in military art, the judgments of the military researcher are related to one another in the thought process. By means of comparison of judgments and the relationship between a newly formed judgment and existing judgments one forms new judgments which contain new knowledge concerning objects and phenomena in military art. Such operations with judgments are called conclusions.

A conclusion is a necessary element in the creative process of the researcher. By means of reworking of ideas, accumulated experience and acquired knowledge in his head, the military researcher performs a complex process of processing all this "material", a mental formulation of new concepts concerning military objects and phenomena.

Conclusions are drawn by induction, deduction and by analogy.

Induction is a conclusion drawn from a knowledge of one degree of generalization to a knowledge of a greater degree of generalization, in other words, an extrapolation from the particular to the general. It is known that in natural and social phenomena there is a definite constancy, a relative stability of correlations and relationships. This constancy and relative stability also give basis in military art, taking into account the knowledge of individual phenomena, to draw the conclusion that the general is also characteristic of other phenomena of the same class.

Induction is frequently used in the exposition of material. In an inductive exposition the author first cites examples, facts and arguments, and then draws a conclusion or generalization.

There are two types of induction: induction through simple enumeration and scientific induction.

In drawing conclusions through the inductive process, through simple enumeration, the general conclusions are drawn solely on the basis of the repetition of facts in the absence of contradicting cases. For example, if in the course of several battles it was noted that the artillery accompanying the infantry made an average of not more than 5 shots for annihilating one enemy tank, the conclusion can be drawn on this basis, that in a future battle every tank will be annihilated by the same number of shots. Such a basis is undoubtedly inadequate for drawing general conclusions and therefore conclusions drawn in this way have the nature of probable conclusions.

Scientific induction does not rely solely on the repetition of facts; it requires the use of analysis in determining the necessary criteria or the necessary relationships of objects and phenomena and general conclusions are drawn on the basis of their knowledge. Such conclusions are reliable if the necessary criteria or necessary relationships on which these conclusions rely have been determined correctly.

We will assume that the military researcher must clarify the distinguishing characteristics of the operation of the 49th army in battles for the liberation of Mogilev. After familiarizing himself with a number of facts concerning this operation, the researcher formulates his first generalization, which is expressed in a definite hypothesis which reflects some general characteristics of these

facts. The material is studied further on the basis of a knowledge of this first generalization. Then, after investigating a further group of facts concerning this operation, the researcher makes a new generalization in which the characteristic features of the operation suggested in the initial generalization stand out still more clearly. This new generalization is used in a study of other facts concerning this operation. The researcher continues in this way until he is able to define the important characteristic features of the studied operation.

General judgments which the military researcher forms as a result of scientific induction usually represents formulations of rules and laws. It should be noted that the conclusions drawn on the basis of induction are by their very nature problematical and require practical checking.

In tactics and operational arts scientific induction is used far more frequently than is induction through simple enumeration because the number of cases on the basis of which any generalization is made is not of decisive importance; sometimes only a few facts are adequate. In drawing conclusions through induction by means of simple enumeration it is always necessary to accumulate the greatest possible number of generalized facts because this increases the probability of drawn conclusions. Accordingly, this type of induction is used extensively in military-technical studies.

Deduction is a form of conclusion in which the researcher proceeds from a knowledge of a greater degree of generalization to a knowledge of a lesser degree of generalization; in other words, there is a conclusion drawn by transition from the general to the particular. The deduction is used in every case when it is necessary to examine a military phenomenon on the basis of general information which is already known and a necessary conclusion concerning its parts must be drawn in relation to this phenomenon.

In deduction, the same as in induction, there is a reflection of the relationship between the individual and the general existing in objective reality. Accordingly, definite conclusions can also be drawn on the basis of deduction. In order to draw conclusions concerning any military object (phenomenon) or on a group of objects (phenomena) on the basis of deduction it is first necessary to find the closest category into which they fit and then apply to them the law characteristic for this entire particular

category of objects (phenomena). Thus, on the basis of a knowledge of the general law of devleopment of an offensive battle of a division under particular conditions conclusions can be drawn concerning the most desirable formulation of the missions for the units and subunits making up the divison.

The military researcher can draw very important conclusions for practical application from the laws of development of definite phenomena in military art.

The term deduction is also applied to the course of exposition of material in a book or article when the author proceeds from general points, rules or laws to less general rules, points or laws. If the author adheres to a deductive exposition, that is, first presents a thesis and then substantiates it with examples, facts and arguments, his exposition will progress from the general to the particular. In the last analysis in this way it will be possible to draw a more detailed conclusion in the form of a complex thesis.

A thorough and profound knowledge of the general laws and rules and their application to specific objects and phenomena in objective reality will make possible a more productive study of objects or phenomena.

However, deduction is impossible without induction. In order to have a deductive conclusion two premises are required; one of these must certainly be general, the general rule which is applied to a particular case in the process of drawing a particular conclusion is derived experimentally by means of induction.

That is why induction and deduction must be understood as two inseparably related logical operations. F. Engel wrote on this point: "Induction and deduction are related to one another as strongly as are synthesis and analysis. Instead of unilaterally praising one of them to the skies at the expense of the other, one must strive to use each of them in its place and this can be done only if one does not lose from sight their interrelationship to one another, the fact that they mutually supplement one another" [11].

The drawing of conclusions by analogy is the drawing of conclusions from the similarity between two objects (phenomena) in one part of their criteria in relation to their [illegible] similarity in another part of their criteria when these other criteria are already found in the first object (phenomenon) but it is still unknown whether they exist in the other object. In addition to this

type of analogy, there can be an analogy when the conclusion is drawn that there is a similarity of causes when there is a similarity of phenomena.

Analogy, like induction and deduction, is based on general laws which are expressed in the fact that important criteria of an object or phenomenon are always related to a series of the same constant stable criteria. Analogy is closely related to induction and deduction and cannot exist without continuous cross-supplementation and interaction.

Analogy is of exceptional importance in military studies. For example, as a result of experiments with the effects of atomic explosions on the animal body under various conditions it can be concluded by analogy what effect an atomic explosion will have on man. An analogy can be used successfully in the course of refuting any false assertion. An analogy frequently leads us to the idea of some hypothesis, although in itself, naturally, it provides no support for the correctness of the hypothesis.

In an evaluation of the reliability of a conclusion drawn by analogy it is necessary to take the following circumstances into account: the scope of our knowledge concerning the subject; the greater or lesser importance of the similar characteristics of the object (phenomenon) which have been found; the depth of understanding of the interrelationship between similar characteristics.

In order to make successful use of the method of research by analogy it is necessary to adhere to the following conditions.

First it is necessary to study the formulated problem to an adequate degree in order to be able to determine clearly the elements similar to those with which one intends to compare them. Then it is necessary to find among known phenomena those which are similar to that being studied; care must be taken that the most important elements of this phenomenon have an adequate similarity to the corresponding elements of the studied phenomenon. Finally, one must study the unknown phenomenon, comparing it with known similar phenomena. In the course of the comparison one must establish the characteristic of the similarity and the differences between them, comparing and weighing them.

Reasonings by means of analogy are so ordinary, easy and outwardly convincing that they are frequently used. However, in many cases when authors

reason by analogy they do not note numerous latent dangers and commit errors. Usually, in examining a phenomenon about which one must obtain definite information, authors turn to a similar phenomenon occurring in the past. The more thoroughly the compared phenomena are clarified, the more precise will be the result. However, in many cases outwardly extremely similar phenomena in actuality differ from the studied phenomenon because their development was determined by other factors. Sometimes, in reasoning by analogy, the researcher goes too far, erroneously applying his reasonings and the conclusions following from them far beyond the actually justified limits.

The principal source of false conclusions drawn by analogy is that the object (phenomenon) in relation to which the conclusion is drawn by analogy has some property which is incompatible with the property concerning whose existence the conclusion is drawn.

Such are the principal forms of conclusions. Naturally, new knowledge can be obtained by this process only if the initial premises are true and if the conclusion is perfect in accordance with all the rules, if in drawing conclusions there is no violation of logical laws which require that thought be definite, ordered, without contradictions and demonstrable. Any person who thoroughly knows an investigated object or phenomenon arrives at a true conclusion in the course of this process. A knowledge of the forms of correct correlation of thoughts in the drawing of conclusions still further accelerates the process of military research and creates favorable conditions for the most correct reflection of military reality. A false point of departure, no matter whether the conclusions are logical and drawn from it, can lead to positive results.

The [illegible] researcher not only has the already mentioned tools of logical thought, but also another important resource, that is, classification.

Classification is the distribution of objects (phenomena) by classes in accordance with the similarities between them, carried out in such a way that each class occupies a definite and stable place relative to other classes.

In military science research classification is the very basis for systematic and scientific work. Until some classification is established in the research it cannot be of a scientific nature and therefore, without such a classification there can be neither experimentation, nor observation, nor

conclusions. Almost always our military experiments and observations are fragmentary and discontinuous; continuity and order are introduced only as the experimental material is scientifically processed.

One must not trust the erroneous opinion that "facts speak for themselves". If one writes down all the collected facts concerning some battle or series of battles, one obtains something which is difficult to read and possibly something which is totally incomprehensible. However, all this must be arranged in a definite sequence and appropriately classified so as to reveal the meaning or significance of the facts; then they will become clear not only to the person who is writing the study, but also to the person who is reading it.

Classification is based on a combination of what is similar and uniform and on the separation of what differs. In this way it also leads to a definite conclusion. The use of a classification led scientists to the greatest discoveries. For example, the great Russian chemist D. I. Nendeleyev gave a truly scientific classification of the chemical elements in the form of a table which he constructed; professional zoologists have classified all the animals populating our planet into genera, species, families, classes, etc. The founders of Marxism-Leninism brought about a revolution in social science by creating a truly scientific classification of the history of society, the classification of socioeconomic formations.

Classification is encountered everywhere in military science. The armed forces are classified by types and in turn each type of armed force is classified by arms; each arm or branch in turn has its own definite classification.

Armed combat also has its own classification: war, campaign, operation, battle. If one considers operations, they can be army, frontal, multiple front, offensive, defensive, etc.

However, that which we classify in nature and in life does not always have set boundaries and one phenomenon or object merges with another, being related by "invisible threads". On this basis repeated attempts have been made in the past to refute a classification, but all these attempts have failed because this would mean that science was refuted. The researcher is in no position to discuss everything simultaneously, in the same breath; he is

forced to limit himself to that which exists as an entity for its systematic examination.

Unquestionably, in order for a classification to serve its purpose it is necessary that the most significant and practically important criteria be used as the basis for classifying objects or phenomena. This must be done in order to obtain a natural classification without any artificiality and fragmentation. The classification must follow from the very essence and nature of what is known. Only this type of natural classification makes it possible upon completion of a study in parts to recreate an integrated whole as the final result of the study. Taking the whole from objective reality, the researcher justifiably breaks it down into parts so that upon completing the study he can reconstruct it in the same integrated form.

It should be noted that the abuse of classifications in scientific research can lead the researcher into a blind alley. With a further breakdown in the classification, lying beyond the limits of general important criteria, the researcher finds an infinite number of special forms.

An erroneous classification system also occurs when a random and unimportant criterion is used as the basis of a classification.

A truly scientific classification is of enormous importance for theoretical and practical activity. In military research it facilitates the process of studying various weapons and combat equipment, the theory and practice of armed combat and affords the possibility for determining the internal laws of military phenomena and developing military theory.

4. Hypothesis in the Practice and Theory of Military Art

A hypothesis is a guess concerning a fact which at present cannot be discovered for some reason or another but which can be discovered without any special investigations or assumptions used in scientific research.

The military leader, be he an officer or general, meets almost constantly with the first type of hypothesis in the course of his practical [illegible]. For example, during battle a commander, in evaluating the situation, never will have exhaustive data concerning the enemy, his defense, manpower, and

equipment, plan of operations, etc. Accordingly, he is always forced to formulate a hypothesis, a guess about the facts which at the moment are unavailable.

The military researcher meets with the second type of hypothesis when explaining various facts and phenomena in military art, when the data for their explanation are unavailable or inadequate and the true reason for the occurrence of events and phenomena is in doubt. In such cases, on the basis of a knowledge of the nature of military science, he formulates an assumption concerning the appearance and development of these events and phenomena. Sometimes it is not necessary to explain events or phenomena, but a regular order explaining a combination of phenomena known from military experience.

A hypothesis is usually formed as a more or less probable conclusion from the facts which do not constitute an adequate basis for considering the truth of the conclusion to be reliable.

A hypothesis is the first step in military science research, leading from a knowledge directly observed in military phenomena to a knowledge of the internal laws of their development. These laws do not lie at the surface and can be discovered only through serious mental and creative activity on the researcher's part. In military science research an extremely original hypothesis can be formulated at the very beginning of the work. The more the researcher thinks about it, the more he is convinced that precisely this hypothesis lays open the way to a new and promising success, the way to the solution of a problem. Then he gathers a certain number of facts in this direction which to some extent can confirm the hypothesis which he has advanced. In actuality, without a hypothesis it is even impossible to think about a study of any problem.

An analogy frequently is the initial phase in the formulation of a hypothesis. Noting that two groups of military phenomena have a number of similar or identical characteristics and knowing what factor is responsible for one of these groups of phenomena, it is postulated by analogy that the other group of phenomena may be caused by the same factor. For example, the experience of operations of cavalry units during the period of the Civil War served as one of the bases for solving the problem of use of tank and mechanized forces in the formulation of the theory of deep combat and operations.

The need for formulating hypotheses in military science is dictated by the very progress in the development of weapons and military equipment as the most changeable element in military art. In actuality, the appearance of atomic weapons, which can be used for both strategic and operational-tactical purposes, makes untenable the former method for explaining many aspects of modern combat and operations. Certainly, the facts of use of this type of weapon in strategic operations are extremely limited, but the facts of its use on the battlefield are nil; there are only a few tests at test sites. Engel's stated: "Observation reveals some new fact which makes it impossible to accept the former method of explaining facts relating to the very same group. From this time the need arises for new methods of explanation relying primarily on a limited number of facts and observations. Further experimental data lead to a purification of these ~~hypothesis~~ hypotheses, eliminates some of them, corrects others, until finally a law will be established in pure form. If we wish to wait until the material is ready <u>in pure form</u> for a law, this would mean that we would have to stop thoughtful research until that time and for this reason alone we would never obtain a law" [12].

A hypothesis has its definite process of development in which it is subject to refinements and corrections, is supplemented by new assumptions and finally is either demonstrated and transformed into a scientific theory or is refuted and replaced by a new hypothesis. It should be noted that a hypothesis is not a stagnant and unchanging formulation. It does not arise as an isolated guess, but always in relation to theory. Arising in relation to a theory, a hypothesis itself strives to become a theory.

The process of formulation of a hypothesis is broken down in logic into three stages. The first stage is the genesis of the hypothesis on the basis of various scientific facts and principles. The second stage is analysis of the basic assumption and formulation of a number of corollaries which follow from this assumption. The third stage is the comparison of the corollaries obtained from the basic assumption of the hypothesis with the observational and experimental data. If this comparison shows that all the corollaries theoretically drawn by means of an analysis of the basic assumption actually are true, this will demonstrate that the hypothesis is probable. Some authors, such as N. I. Kondakov in his book entitled "Logika (Logic)" (Uchbedgiz, Moscow, 1954), break this process down into five stages.

If the hypothesis is not artificial and is not a devised contrivance, but is actually a sound scientific assumption corresponding to reality, on the basis of its basic assumption it will be possible to explain not only earlier known phenomena, but also phenomena which become known later. The more new facts are confirmed which explain the basic assumptions of the hypothesis, the higher will become the degree of probability of the hypothesis.

The hypothesis advanced in military science studies are in need of mandatory checking. One of the basic aspects of checking a hypothesis in the field of tactics and operational art is the field exercise.

The military clique in the imperialistic countries, in making preparations for a great war, frequently use so-called "small wars", wars against the peoples of the colonial and dependent countries, and also against small countries, for checking various military hypothesis. Such wars are unleashed for the purpose of enslaving peoples and establishing a desired political regime in other countries. For example, such wars occurred in 1936 in Spain and after the Second World War in Korea, Viet Nam, Egypt and Algeria.

In the military-technical fields of knowledge one of the most important truths in support of a hypothesis can be the discovery of a phenomenon by means of special experimentation which prior to the formulation of the hypothesis had never been directly observed, was not known and whose existence was first postulated on a theoretical basis. For example, many types of arms were visualized theoretically long before their invention.

By means of checking a hypothesis can be transformed from a probable assumption to a demonstrated and reliable fact.

5. Some Characteristic Methods of Proof Used in Military Science Research

The military researcher, like a researcher in any other field, demonstrates the truth of his judgment and concepts, refutes the judgments and concepts which he considers false, that is, he demonstrates the correspondence between his ideas, judgments and concepts and objects and phenomena in armed combat.

Many centuries of experience in scientific research have convinced scientists that validation, proof, is the most important property of correct thought. Only in this case is the latter a reflection in the researcher's

consciousness of the most general laws of objective reality, the interrelationships, intercausalities of objects and phenomena. However, the relationships are different. Some of them are obvious and others are not directly apparent. Accordingly, the ability to demonstrate the necessary relationship between thoughts in the process of any reasoning, in which the relationships of military objects and phenomena are reflected, is a very important characteristic of the thought of a military researcher.

Demonstration is that logical operation during which the truth of any thought is validated by means of other thoughts, the truth of which is demonstrated by actual practice. Lenin wrote: ". . . man demonstrates the objective correctness of his ideas, concepts, knowledge and science by his <u>practice</u>" [13].

Any demonstration must contain a thesis (which must be demonstrated), an argument (a thought which is presented for validating the thesis) and a method of demonstration.

Proofs are direct when arguments indirectly substantiate the truth of a thesis and indirect when the truth of the thesis is substantiated by refuting the truth of a contradicting position. Logical methods of proof give the researcher's thoughts good structure, consistency and persuasiveness.

All forms of conclusions are used for proof: induction, deduction, and analogy. However, regardless of what form the proof assumes there must be adherence to conditions ensuring that a proper conclusion will be drawn. The principal condition for proof is trueness of the thesis and argument, that is, their correspondence to reality. The most convincing proof is proof with facts. However, the military researcher must take into account that obtaining factual data is extremely difficult and in individual cases is simply impossible, particularly during peace time.

In military science study, in contrast to the dogmatic approach based on invariable and eternal principles of military art, a truly scientific proof requires a critical checking of the facts, the determination of specific conditions, the place and time at which military event occur.

However, the presence of a true thesis and arguments is only the condition for proof. One can have a true thesis and true arguments and still not prove the thesis. A successful course of proof requires adherence to the

laws of logical thought during the course of all the reasoning, during which, as already indicated above, there must be adherence to definite rules of correlation and combination of arguments, thesis and arguments. The logical proof of any judgment by means of other judgments, whose truths are unquestionable, proceeds without difficulty. The method of proof always contains a logical relationship of judgments leading to a definite logical result. Unconvincing proofs in military science research are encountered most frequently as a result of violation of the logical relationship between judgments in exposition.

Proof by means of refutation of any assertion is obtained by means of several methods. The truest and at the same time the simplest refutation method is refutation by facts. However, facts sometimes cannot refute arguments; there are no facts and no experiment can be conducted. Then the arguments which are advanced by the opponent in validating his theses can be subjected to criticism or it can be demonstrated that the truth of a refuted thesis does not follow from the arguments cited in confirmation of the thesis.

In addition to these methods, for the purpose of proof by refutation one can prove a new thesis which is an opposite or contradicting judgment relative to the thesis being refuted. In some cases for the proof by refutation one can temporarily admit the thesis being refuted to be acceptable, but then draw such corrolaries from it which contradict the truth.

With respect to parts of a proof, logical errors can be grouped in the following way.

The first group of errors includes those relating to the thesis of the proof. The most common error of this type is substitution of the thesis, when a false thesis is advanced in place of a true thesis.

For example, if the researcher has advanced a thesis that the creation of an advantage for the enemy in manpower and equipment is the basic condition for victory, but then in the course of examining the problem he asserts that the principal condition for victory is the winning of control in the air, and devotes the greater part of his study to this, he has substituted the thesis.

The second group of errors are those which relate to the basis of the proof. The most common error in this group is the proof of a thesis by false arguments. For example, a researcher has advanced the thesis that for successful combat with tanks it is necessary to establish a zone of continuous

antitank fire in front of the main line of resistance. However, as proof of this thesis he did not give the number of weapons required for creating such a zone, but only the arrangement of these weapons for a depth of 500 m. It is entirely obvious that he used a false argument for his proof.

Frequently another error in this group is encountered when the basis for the proof is in fact the composition which must be proven in order that the thesis be considered demonstrated.

Such an error is frequently encountered when the author presents his hypothesis in the form of diagrams. After representing some advanced hypothesis in the form of a diagram, he then draws the conclusion that this is exactly as it should be.

Finally, another error in this group of errors is when the thesis is demonstrated by arguments whose truths are demonstrated by the thesis.

The third group of errors includes those pertaining to the method of proof. In this group of errors it is most common to encounter an error related to violation of the proper rules in drawing conclusions, in particular, hasty generalization. For example, in describing the methods for combat operations in relation to weapons and military equipment, organization of forces, quality of manpower, etc., the author only examined one or two of these factors and completely failed to take the others into account and on the basis of what was examined he drew a definite conclusion, whereas the examination of other factors could introduce considerable corrections into the conclusion or completely change it. Among the errors in this group is the error from saying something in a relative sense and then in a non-relative sense, that is, unconditionally.

A knowledge of these groups of logical errors helps the author to detect and eliminate them in time and thereby greatly increase the scientific value of his work.

Thus, in order to conduct a scientific study successfully, one must be able to think logically and correctly present his thoughts on paper. However, a knowledge of logic furnishes only the necessary technical procedures for proper thought which can be applied only on the granite foundation of Marxist dialectics.

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Chapter IV

STATISTICAL METHOD IN MILITARY SCIENCE RESEARCH

1. Sphere of Application of the Statistical Method in the Study of Military Phenomena

Statistics is a social science concerned with quantitative aspect of large-scale social phenomena in an inseparable relationship to their qualitative aspect. It is based on the principle of the Marxist [illegible] method and the interrelationship and intercausality of phenomena, their inseparable development and the transition of quantitative changes into qualitative changes. At the present time military statistics and a number of other special types of statistics (industrial statistics, agricultural statistics, mathematical statistics, etc.) exist and are being used more and more extensively.

Military statistics is a branch of military science which studies the quantitative and qualitative indices of the military-economic and military capabilities of countries and the organization, supply and training of armed forces. Military statistics, in studying the quantitative aspect of specific military phenomena and processes in war, reveals their size, distribution and rates of development.

In a study of wars and military phenomena extensive use is made not only of military statistics, but also such special statistics as mathematical statistics, the statistics of structures, population statistics, etc.

The statistical method in military science research is acquiring greater and greater importance during our time. The military researcher never operated with such an enormous quantity of all kinds of figures and now having the method of statistical-mathematical analysis, never penetrated so deeply into the field of military science research and never took into account such a great number of disciplines as is now the case.

Earlier the statistical method, as a method in military science research, was used in military geography and served for the most part in providing the strategists with data which revealed the military-economic, moral and military potential of the investigated countries, the extent of their preparatons for war, their military and mobilization capabilities with respect to human resources and transporation, the status of the armed forces of the countries,

the ratio of types of armed forces, the principal kinds of manpower and reserves, etc.

Now this method is being used most widely in operational art and tactics. It is used in formulating various norms for the combat activity of forces, as well as for their tactical and operational training. Without using this method it would really be inconceivable that one could formulate effective methods for the combat use of artillery, the air forces, naval forces, etc. Without the methods of statistical analysis it would be impossible to make even a single test of any type of weapon and combat equipment and it would be impossible to draw sound conclusions from army and experimental exercises, combats and operations. The statistical method is the basis for development of a number of computers used in military science. Finally, calculations, record keeping, planning and the organization of military science work, both in the armed forces as a whole and in its individual arms and branches, is a highly important sphere of application of the statistical method. The sphere of application of the statistical method in the study of military phenomena is so varied that in this manual it is scarcely possible to list all the cases of its use, much less consider them in detail.

Dialectic materialism teaches that any phenomenon has its causes. Military phenomena, as complex phenomena, usually arise under the influence of more than one cause. In some cases these causes play equal roles and are manifested with the same intensity, whereas in other cases they are of unequal importance and are manifested not only with dissimilar intensity, but sometimes act in opposite directions. Phenomena in the first group are easily studied and are identical. By knowing one of them the researcher can form an opinion concerning the others. Phenomena in the second group have characteristics of individuality. On the basis of a study of one or more phenomena in this group a researcher cannot form a judgment concerning other similar phenomena. Hence a particular difficulty arises in studying such phenomena and special methods are required for determining their typical characteristics and patterns. Such a method is the statistical method which is used in all sciences for studying those phenomena which have a random character and are massive by nature. Large-scale observation and corresponding statistical processing of observational data affords the possibility for detecting the difference and similarity in individual phenomena and discovering a definite pattern in their development.

In the field of study of armed combat the statistical method is essentially the only method for quantitative study and precise analysis. In this field an individual battle or operation takes place under the influence of a combination of causes, including random factors, which is more complex than in virtually any other sphere. Accordingly, the atypicality and individuality of these phenomena are manifested at all times and all places. In actuality, there are no battles or operations which are similar to others in all their characteristics, at least the essential ones. This can be attributed primarily to the fact that in the phenomena of war there is not merely an intertwining of various factors, but that among these factors there is one with a clearly expressed subjective character, such as the human will, something which is manifested in a great number of individuals on both sides.

The application of statistical methods to study of those military phenomena in which a great variety of human individualities is involved makes it possible to determine the correctness and the consistency of the phenomenon, provided that we proceed from observations of individual cases to large-scale observations.

For example, we frequently speak of the great importance played by morale during wartime. And this is actually the case. Accordingly, the bourgeois military leaders have been forced to devote great attention to this problem. However, they relate morale only to the physical strength and psychic state of their people. Howe , while not denying the great importance of physical hardening, mental de lopment, training in military skills, combat experience, experience in enduring the difficulties and dangers of war, etc., it is our opinion that it is sociological factors which are most important. All other conditions being equal, an army and a people who are fighting for the right, who are defending the most progressive social structure, have incomparable advantages over the aggressive armies, over soldiers who are fighting for interests which are foreign to them. The experience of the past fully confirms this. The experience of any war is evidence that when it is necessary, people perform during wartime many things which are entirely unlikely from the physical and psychological points of view.

The problem arises as to how to evaluate the morale of troops because the moral factor does not concern as an abstraction, but as an actually existing material force determining the combat capability of units and subunits. Many

different circumstances must obviously be taken into account for making such an evaluation. Large-scale observations can yield an important result. An example illustrating this is given in a book by S. I. Gusev entitled "The Civil War and the Red Army" [1].

S. I. Gusev, on the basis of a statistical analysis of the Civil War, presents data on the combat capability of units during that period in relation to the number of Communists in the unit. It was found that if a military unit contained less than 6% Communists, it was completely unready for combat. Units having from 6 to 12% Communists were only more or less combat ready and only units in which the percentage of Communists was greater than 12% were entirely stable and combat ready. As we see, these facts and a corresponding analysis made it possible to draw a scientifically sound conclusion even concerning such a problem as the principle for making up military units.

Large-scale observation thus acquires the importance of a very powerful tool in research work.

The use of the statistical method is particularly productive for those military phenomena which are not only numerous, but also simple and approximately uniform. These conditions correspond to the highest degree to such phenomena as the firing of artillery and the dropping of bombs by aircraft on targets of a designated type under comparable meteorological conditions and similar conditions of enemy counteraction, execution of marches by units and subunits over great distances, expenditure of ammunition for suppressing targets of the same type in the enemy defense, etc.

The use of the statistical method in a study of operations and battles of land forces involves great difficulties. In such cases the phenomena are always so complex and varied that for using the statistical method for finding any characteristic of the conditions it is first necessary to perform a great amount of mental analytical work, directed to a clarification of what statistical data must be used, and then it is necessary to study a very large number of operations and battles. However, in some cases the individual aspects of operations and battles can be determined without a relatively great expenditure of work. To the extent that the sides adhere to already developed procedures and operational tactics during operations and battles, in every case it will be adequate to consider only those deviations which occur in the investigated operations and the results which they lead to.

The advances attained in the field of cybernetics and the development of high-speed electronic computers with programmed control still further broaden the possibilities of the statistical method. A very important characteristic of computers is their capacity for accumulating and storing a large volume of numerical data and manipulating these data in an extremely short time. The fact that statistical solution of problems which earlier could not be solved by researchers has now become possible, is greatly broadening the field of applicability of the statistical method.

The statistical method makes it possible to find patterns manifested in large-scale military phenomena and determine their causes. As long as the military researcher only describes some phenomenon he usually has no need for recourse to the statistical method. However, as soon as scientific thought rests on the need for a reasonable explanation of described facts and phenomena in military art, the situation changes shortly. Here any penetration into the depth of the phenomenon leads to the representation of all the facts and phenomena as the mean, most probable result of the collective actions of an enormous number of people employing their weapons and military equipment.

The statistical research method requires a material analysis of the studied phenomenon. The use of the statistical method without regard for material analysis is, to use Lenin's expression, "playing with figures". All statistical manipulations with figures are nothing more than material calculations. Regardless of what mathematical procedures the researcher uses, he will never deal with reckoning units or reckoning sets without regard for their material nature. The specific peculiarity of the statistical method is that it aids in transforming theoretical concepts, measured, qualitative characteristics, into quantitative characteristics and assists in establishing an interrelationship between the quantitative and qualitative aspects of the studied phenomenon. As soon as the researcher forgets the qualitative characteristic, he mandatorily falls back on all kinds of artificial "standards" and "rules".

For example, it is impossible to analyze the armament of enemy divisions if the study is based on statistical data calculated for all types of armament without allowance for their quality. This is particularly important now that various types of atomic weapons are included in the weapons pool.

A prerequisite for any statistical study is a definite theoretical structure. One must mentally visualize the entire structural scheme of the investigated phenomenon and then proceed to an analysis of the quantitative and qualitative aspects.

Without a correct dialectic understanding of any military phenomenon it is impossible to analyze the numerical statistical data characterizing it. Without this, the statistical data are no more than a pile of figures which can only disorient the researcher. Only when guided by the dialectic method can one use figures in "statistically" expressing the investigated processes and phenomena. An example of such a solution of a problem is found in the writings of K. Marks. He writes: "Only by reasoning out the relations operating during the formation of the standard for profit do statistics acquire the capacity for undertaking a true analysis of the standards for wages in different eras and in different countries" [2].

In military science research one can use the already available data from military and military-medical statistics, economic, industrial, agricultural and other statistics.

For example, such data from military-medical statistics as the nature of wounds (from fragments of artillery shells or aerial bombs, from small-arms fire, etc.), can provide the military researcher with data which will enable him to draw conclusions concerning the effectiveness of each of these types of weapon and formulate measures for protection against each of them.

Already available data from economic statistics, be it of industrial or agricultural nature, make it possible to draw conclusions concerning the military-economic potential, the possibilities of large-scale supply of the army with new models of arms and military equipment, the possibilities for supplying the army with food, etc. Data on railroad and other types of transportation can indicate the times required for concentrating reserves and bringing them up to the front. The transport of material goods for supporting an operation, etc.

When using already available statistical data their interpretation must be approached from a thoroughly basic, sound and Party point of view and these data must be checked and critically reworked. V. I. Lenin, during work on his study entitled "Development of Capitalism in Russia" ". . . checked extremely

closely, critically reworked and again and again regrouped the vast amount of data from the official and district statistics" [3].

However, in most military science studies, not devoted to the field of strategy, statistical data are required which are not available in already compiled form. The military researcher must be able himself to do all the work with the data for obtaining such data. Like the physicist himself deals with statistical data in the field of physics, not a statistician, so also in military science the statistical study is made by a military man, not by a statistician.

The sources for obtaining statistical data may be military materials, such as plans for operations and battles, written reports, speeches, communications, operational summaries, orders, etc., the materials from experimental and army exercises and maneuvers; data on tests of various kinds of weapons and the military equipment, etc.

It goes without saying that the data obtained on the basis of a study of the experience of past wars and the experience of army and experimental exercises and tests at proving grounds are not of equal value. Data from the experience of past wars usually has the nature of random observations because they were made without a strictly formulated scientific system for determining the characteristics of military phenomena and therefore it is extremely difficult to find exhaustive data on various problems with which we are concerned. In most cases in order to obtain a few dozen facts it is necessary to go through "mountains" of archival materials.

Experimental exercises, as well as tests at proving grounds, can be done specifically for research purposes; in such cases the military researcher can formulate a plan for the exercise and a program for the tests and carry out the necessary number of observations.

Army exercises, which do not have special research purposes, can also be used by the military researcher for obtaining some observations, although in this case his task is unquestionably complicated by the fact that he personally cannot visit a large number of exercises and the reports on exercises may not contain the data with which he is concerned.

The problems of how to collect, process and analyze correctly the numerical characteristics of various military phenemona and processes, how to group

the numerical data correctly and find the corresponding indices properly reflecting the essential characteristics of the phenomenon, occupy a special place in the use of the statistical method in military science research when already compiled statistical data are lacking.

The statistical research method arbitrarily consists of three stages: the first is statistical observation (including preliminary work); the second stage is transition from individual data to the numerical description of sets or combinations of observed units, to the general results; finally, the third stage is the determination of generalizing indices, their reckoning and analysis of the results.

2. Statistical Observation in Military Science Research

Any observation is an analysis of facts. Statistical observation in military science research is a planned, scientifically sound collection of information (the recording of facts) concerning military phenomena or individual aspects of military phenomena in accordance with a uniform program and methodology.

The principal problems involved in statistical observation are: selection of the observed object, observation units and recorded criteria.

The observed object is dependent on the problem which is to be solved and therefore in each specific case it may be extremely different. For example, in a study of a defensive battle the divisions, units and subunits which waged defensive battles during the course of the Great Fatherland War can be subjected to statistical observations. In each case observations can be made using such indices as the width and depth of the defensive zones, sectors and regions, density of manpower and fire space power, number of trenches, positions and zones, etc. In the testing of any type of weapon the objects for statistical observation can be: percentage of fix, mean deviations of shells (mines, bullets) from the target, etc.

In actuality, it is not possible to give any full list of observed objects for the purposes of military science research. Even in the study of any single problem the observed objects may be extremely different. For example, in his study entitled "Strategy and Economics" [4] A. Lagovskiy examines such observed objects as the expenditure of funds on mobilization; the percentage of expenditures on military equipment; the number of shots from different

weapons in a division per minute; the production of various kinds of weapons and ammunition both in our country and in enemy countries during the First and Second World Wars; the number and duration of frontal attack operations; the number of mobilized men in relation to the number of workers employed in industry; the expenditure of strategic raw materials for the manufacture of various kinds of military goods; the preparation of the theaters of military operations; bombardment of the German aviation industry; the production (output) of the most important types of strategic raw materials in Germany during 1943-1945; the dependence of the United States on the importation of strategic materials and the situation with their supplies, and a number of other problems.

It is entirely obvious that in other military studies there may be no need for such extensive statistical data. However, in a study of any problem in strategy, operational art and tactics it is now impossible to avoid making statistical observations.

One of the basic problems in organizing statistical observation is the problem of the sources for obtaining the necessary information.

The most valuable source of information is the direct perception of phenomena by the researcher himself, so-called "direct observation". This type of observation in military science studies can occur when the researcher, in being present at army or experimental exercises and maneuvers, counts the individual units with which he is concerned or makes necessary measurements, in short, he himself perceives the phenomenon. This method is considered more reliable because the psychological property of man is such that he believes himself more than he believes others.

However, direct observation is not always applicable in military phenomena. A participant in a war undoubtedly is not concerned with purposeful observation; he must be concerned with combat. The possibilities of groups of officers for generalizing wartime experience are also limited. A participant in a war still has need for scientific research after the war has ended. In many cases, in fact, a military researcher who was a participant in the war will seek out even his own documents and records in the archives.

Direct observation at army and experimental exercises is limited primarily by space and time. The military researcher cannot always visit those places where exercises are conducted and if he can, only a few of them.

All this forces the researcher to have recourse to the aid of indirect perception by the collection of materials with which he is concerned from other individuals by means of interrogation.

Direct observation and interrogation have the common property that the collection of the material necessary for statistical processing is their direct object. The use of this material in the course of statistical work is called primary statistics.

In most cases the military researcher for studying any large-scale phenomenon uses already available data collected for some completely different purpose. This may be a report presented to a superior echelon concerning the results of a battle or operation, communications on losses, an operational summary, a report on an exercise which has been completed, etc. The use of such material is called secondary statistics.

The data obtained from official documents during the course of secondary statistics is usually characterized by a greater accuracy. However, there is also erroneous numerical data, particularly when this applies to losses inflicted on the enemy. Accordingly, the data obtained from operational summaries, reports, etc., should be compared with the summaries of captured records and other data.

Since the materials from the experience of war and exercises are frequently the only sources from which various data can be corrected for drawing statistical conclusions, they must be as complete as possible; on the other hand, military-statistical agencies are faced with the task of working on problems to which answers must be given in those official documents (communications, reports, speeches, etc.) which will later be the principal source of statistical information.

In some cases statistical observation can be based on documents not directly applying to the investigated theme, that is, the observational data can be obtained indirectly. For example, data on enemy losses of weapons and military equipment are obtained from captured enemy documents, data on the effectiveness of the fire of various types of enemy weapons, from data from army medical institutions and military-medical statistics, whose observations are registered in special card catalogs.

A condition for the success of statistical observation is the training of the researcher for systematic conduct of such observations, the ability to collect the necessary data, a lack of bias during observation, as well as the ability to formulate and implement a plan, organizing the entire work of the researcher from beginning to end.

A lack of bias in statistical observation requires that a researcher must not take individual facts arbitrarily, but the entire set of facts relating to the particular problem without any exception. Only in this case is it possible to determine an objective relationship and the interdependence of phenomena.

The selection of a unit of observation is also closely related to the investigated phenomenon. An observation unit is a value which is characterized by significant and uniform criteria. For example, in a study of a phenomenon related to the expenditure of artillery shells, the observation unit can be one definite type of shell or an arbitrary shell to which all other shells must be "reduced". The observation unit cannot be confused with a reckoning unit. For example, if one determines the number of soldiers in subunits for the purpose of determining their number in individual subunits, the soldiers will be a unit of reckoning, but the observation unit will be their number in each subunit.

An observation unit is also the carrier of significant criteria; it is also registered during observations. Thus, in the course of observation statistical material is collected which characterizes each observation unit individually. Statistical observation, like any observation, is limited by space and time. For example, if the march of a division is subjected to observation the observer registers not only the points where they pass, but also the times of their passage.

However, it is not always easy and simple to break down the observation unit into its simplest parts and find those criteria which adequately define the qualitative characteristics of the objects.

The number of observations is dependent on the stipulated degree of accuracy for the desired result. In general, it is always necessary to strive to obtain the greatest possible number of observations. From this point of view the best observation is one which covers all the objects of the studied phenomena, a so-called "continuous" observation. However, in actual practice,

the accomplishment of a continuous observation frequently involves great difficulties. Accordingly, in most cases selective observation is employed. The essence of selective observation is that the observer does not observe all objects of the studied phenomenon, but only part of them.

Selective observation is closely related to still another form of non-continuous observation, so-called monographic description. The essence of such description is a detailed description of individual objects of any phenomenon for the purpose of characterizing all similar phenomena. The basis for this is assurance that the units observed are typical.

3. Grouping Procedures in the Method of Military Statistical Research

Statistical data collected in the course of observation characterize phenomena in which the individual aspects are manifested in very different form. For this reason it is necessary to reduce the data from statistical observation (together with the phenomena reflected by them) into definite groups corresponding to types and categories of these phenomena, that is, distribute them in uniform groups. For example, the personnel of any military unit can be grouped by military titles, by age, by education, by military training, etc. Weapons can be grouped by types, range, purpose, effective use, etc.

Depending on the specific purposes of our study, scientific processing is broken down either in the direction of a description of a massive phenomenon by means of characterization of its reduced criteria, or in the direction of explaining a massive phenomenon and determining the relationships between this phenomenon and other phenomena or the relationships of its individual elements to one another.

It should be noted that the reduction and scientific processing of statistical data are connected by a close and unbreakable thread: on the one hand, without scientific processing of data the simple reduction of the results of statistical observation cannot be considered a finalized piece of statistical work; on the other hand, without a preliminary reduction of data it is impossible to have reduced values which will express the final result of the scientific processing.

An external expression of the close relationship between reduction and scientific processing of statistical data is the circumstance that the tables designed for reduction or summarization usually are prepared before and facilitate the scientific processing.

The essence of reduction of statistical data consists in a reckoning of the results of individual elements of statistical observation which yield the possibility for their further processing. In order for the results obtained in the reduction process to be completely graphic and to be usable in processing for the formulation of definite conclusions scientifically, the results are usually placed in tables.

In preparing the tables, the researcher must take care that the following be observed: division of the material must be strictly matched to characteristics and we must realize that the titles used in one branch of military science may be inapplicable to the numerical data in another branch;

-- the breakdown by sections in every case must be done in accordance with a single general criterion and in such a way that these sections are mutually exclusive of one another but when taken together exhaustively cover all the basic content of a particular phenomenon insofar as is possible;

-- tables giving an overview of a particular phenomenon must agree with tables which incorporate the results of earlier studies;

-- these sections must be prepared solely on the basis of those criteria which cannot be discarded doing further processing, but at the same time they must exhaustively cover all the most important criteria because what is omitted either cannot be supplemented at a later stage or will require much additional work. Accordingly, in the formulation of a table it is necessary to know what is interesting and what is not interesting so that time will not be wasted.

Statistical tables can contain exclusively absolute figures or be filled with summarized values (mean or relative); sometimes the same table can include columns for the summarization of absolute values and columns for giving composite criteria.

In having recourse to the assistance of tables, one must remember that the breakdown of statistical data must not be limited to external criteria; it is necessary to go farther in the direction of studying the internal content of the combination of data. However, the excessive breakdown of the overall data can only impede rather than facilitate the research task. Accordingly, one must avoid both too many general tables and too many detailed tables. The ability to construct a table is gained by experience and can scarcely be taught from a theoretical approach.

In addition to tables, the final result of statistical work can be expressed either in the form of a great number of figures (mean values, totals), arranged in a certain sequence, statistical theories, or graphically (by diagrams, figures, curves, etc.)

In military science work the graphic representation of statistical data is used very extensively. The basic importance of this method is that by examining diagrams the reader is freed to a certain extent from the need of performing the mental work which is required for reasoning out the sense and meaning of the figures in a statistical table; this makes the statistical conclusions clear for any military reader. Graphic representations, facilitating the perception of statistical conclusions, also reveal to the researcher such characteristics of the investigated phenomena which he could not pick out of tables.

The grouping procedure is one of the most important and effective procedures in the statistical research method. It is used extensively in a study of the structure of phenomena. For example, in order to explain the organizational structure of artillery subunits and units included in combined-arms unit, division or larger military formation, it is necessary to break them down by groups in accordance with criteria indicating the purpose, number of personnel, armament, etc. By comparing the grouping indices for some time interval, it is also possible to determine the structural shifts which have occurred in the phenomenon.

The groupings procedure is of great importance for a study of the relationship and the dependence between individual criteria within a statistical set, for example, the distribution of units and combined units by rate of attack as a function of their reinforcement by tanks or artillery, etc.

The criteria of groupings in operational-tactical studies are extremely varied and accordingly we simply cannot [illegible] them. As an example we can cite groupings on the basis of the following criteria: In a study of offensive combat or operation we have the breakthrough front, the width of the attack zone, rate of attack, duration of attack, etc.; in a study of the effect of artillery weapons against tanks we have armor penetrability, rapidity of fire, percentage of hits, etc.; in a study of the combat use of bombers against ground targets we have the deviations of series of bombs from targets, losses from enemy antiaircraft fire, neutralization time, etc.

Combined groupings are extensively used in the statistical research method; in this case the elements of the investigated set are grouped simultaneously on the basis of two or more criteria. Combined groupings make possible a fuller description of the investigated phenomenon.

V. I. Lenin developed a scientific theory of the method of statistical groupings for the study of socioeconomic and political phenomena. The military researcher must be able to apply this theory in a study of military phenomena. "In using grouping by land allotments", wrote Lenin concerning the antiscientific method of the Russian populace, "we throw together the poor peasant who loses his land and the rich peasant who leases or purchases land; the poor peasant who abandons the land and the rich peasant who 'collects' land; the poor peasant who maintains his poor farm with an insignificant number of cattle and the rich peasant who has many cattle, fertilizes the land, introduces improvements, etc. In other words, we combine the rural proletariat with the representatives of the rural bourgeosie" [5]. The entire problem and all the difficulty arises because of the way in which these data were grouped.

Using these Leninist principles, the military researcher in the grouping of statistical data must use particular care in evaluating all aspects of the investigated phenomenon in order to achieve a correct grouping. It is always necessary to obtain a natural grouping corresponding to the very essence of the investigated phenomenon. It is impossible to mix important and significant factors with those of secondary importance because this may lead to a clouding of the picture rather than to a breakdown of the phenomenon and a clarification of its essence.

It should be noted that the grouping method has much similariy to the classification method examined in the preceding chapter. Accordingly, in the grouping of material it is necessary to adhere to the basic requirements imposed on classifications.

The grouping of data in itself in some cases can indicate the presence of a causal relationship between variations in figures, reflecting some phenomenon or other, and the gradation serving as a basis for grouping of the numerical criterion. In many cases it is possible in this way to determine the relative effectiveness of two different types of arms or two different methods for thier tactical use and on the basis of this comparison one can formulate combat methods ensuring attainment of the maximum tactical or operational success.

For example, by means of rockets or aviation it is possible to annihilate concentrated groupings of the enemy, disrupt his communications, wage combat with hostile ships and destroy military-industrial objects. Comparison of the effectiveness of rockets and aviation makes it possible for the military researcher to make the most objective possible quantitative comparative analysis. It should be noted that in such an analysis it is necessary to omit some important factors of types not subject to quantitative evaluation, such as morale and psychological factors. The influence of such factors can be taken into account in some degree during the formulation of the final conclusions.

However, in some cases the adopted basis for the grouping in itself says nothing decisive about any causal dependence. A causal relationship is established as a result of an examination of two parallel rows of figures. It is only necessary that the basis of the grouping and the method used be correct. For example, let us visualize two rows of figures: one, the upper row, represents the army receipt of new types of weapons in percent of all the weapons of units; the other row represents the increase in the rates of attack of units. By a comparison of such rows of figures one can always note that when there are rather significant deviations from a complete parallelism in them there is always a general pattern expressing the interrelationship and the interdependence of these two factors.

This latter method can give the military researcher very important conclusions whenever the figures are grouped in rows on the basis of an identical criterion, regardless of what it may be. It makes no difference whether the basis for constructing the rows to be compared is a time or space criterion or any other criterion. The essence of the matter is always the same: variations in statistical coefficients in some rows or series are accompanied by corresponding or opposite variations in other rows or series.

The grouping of data on the basis of a definite criterion always assumes the existence of some ideas concerning the conditions existing and effect on the investigated phenomenon. The researcher groups data on the basis of some particular criterion rather than on the basis of some other criterion only because he sees this criterion as one of the factors exerting an influence on the particular phenomenon. An approach to the grouping of data without any specific in mind cannot lead to the desired results.

At the same time, when there are tables already available, regardless of whether they were prepared by the researcher himself or are taken in prepared form, it is always necessary to strive by means of comparison of parallel series to check on the existence of causal relationships of which there can be no assurance in advance. In some cases such a comparison can lead the researcher to far more unexpected results, to discoveries which were unthinkable when using other analytical methods and which can suggest some pattern hidden in the depths of the phenomenon

It can happen that after comparing series of figures there is no apparent dependence and nevertheless such a dependence does exist and for its revelation it is necessary to process some comparable series, that is, reduce them to larger groups. For example, if one compares the dependence of the degree of training of artillery men on different training methods during short time intervals it may be impossible to detect a significant difference in training. However, it is sufficient to take longer or shorter time intervals and this dependence will become completely obvious.

A second grouping of compared series is required in some cases for determining the dependence. Individual figures of one of the compared series representing a phenomenon, in which a corollary is assumed, are broken down into groups consisting of an identical or almost identical number of terms in a series representing a phenomenon in which a cause is assumed. A mean value is obtained for each such group and the resulting series of mean values show the existing objective dependence of cause and effect.

4. Computed Generalizing Indices in the Statistical Research Method

Methods for determining so-called "generalizing indices" are used for the numberical exposition of the entire set of observed facts. The derivation of such indices and then their calculation and the analysis of the results of reduction constitute the last stage in a statistical study.

A generalizing statistical index is a numerical expression of some aspect, some property or criterion of the investigated object; it is not an individually taken unit, but a definite group of units taken together, that is, in their totality. Such indices are usually formed as a mean value applicable to a single unit or as a ratio between the values of some index for individual groups and sets as a whole.

The most important and widely used computed generalizing indices in statistics are the relative and mean values, balances and indices. In military science studies it is most common to use relative and mean values.

Relative values are used in characterizing the structure of a phenomenon, its temporal changes, intensity and a number of other relations. For example, among the relative values of intensity there are coefficients characterizing the ratio of losses of aircraft to the number of combat missions, a ratio of wounded to combat losses, the ratio between the extent of boundaries and the area of a country, etc.

When using the statistical method in a study of the development of the military economics of any country it is common to use indices; these are relative numbers which most clearly characterize the dynamics of the examined phenomenon or the degree of implementation of a plan for the production of definite items of armament or other military production. By using indices one can study changes in values which cannot be directly compared.

In an analysis of military-economic phenomena it is increasingly more common to employ the balance method; its use makes it possible to determine relations and proportions in the development of definite branches of military industry and makes it possible to correlate and check mutually related statistical indices.

The military researcher can use such balances as the balances in production of weapons, items of equipment, supplies, etc., as well as the balances in production and consumption of steel in a country, financial balances, labor balances, and a number of others.

Mean values play an exceptionally important role in the analysis of many military phenomena. The expenditure of supplies during an operation or battle, the daily rate of advance of forces during attack, the density of manpower and equipment in a breakthrough sector and other similar values are usually calculated as mean values.

Naturally, mean values, if they are computed on a sound scientific basis, cannot be regarded solely as a numerical expression of some aspect, property or criterion of the investigated object (phenomenon). A properly computed mean value gives an objective numerical characteristic of the real importance of

the property or criterion in a particular actually existing set or combination. However, any such set or combination exists under definite conditions. If these conditions are changed, there is also a change in the properties of the units in the set, the interrelationships of these units and their criteria, as well as the individual values of the criteria. Accordingly, there is also a change in the mean values expressing the levels of these criteria.

The most important and decisive condition for a correct and scientific use of statistical means is a qualitative uniformity of the set for which the mean values are computed. According to the definition given by K. Marx, " . . . the mean value is always the mean of many different values of the same form" [6]. This means that the units of the set for which we compute the mean values and differ from one another quantitatively with respect to the value of the studied criterion, that must be qualtitatively uniform, must form a set of units of the same type.

Mean indices cannot be obtained for qualitatively different phenomena or for qualitatively varying criteria. For example, it is impossible to compute a "mean profession" (civil) or a "mean nationality" of the personnel of any unit, etc.

Various types of mean values are used in the statistical method for study of military phenomena. The most widely used value is the mean arithmetical value. It is used in the statistical study of most military phenomena and is simple to compute. However, in such military disciplines as the firing of artillery, dropping of bombs by aircraft, etc., in the testing of the accuracy of operation of various types of instruments and various kinds of weapons it is common to use the mean square value.

As the mean arithmetical value we use the value obtained by dividing the sum of all the individual values by the number of observations. We will assume that in firing at tanks with point-blank fire an average of two tanks was destroyed per weapon during a single defensive battle; in another battle three were destroyed per weapon; in a third battle one tank was destroyed per weapon, etc. By adding the number of destroyed tanks during the entire time of the battles and dividing them by the number of observations we obtain the mean arithmetical number of tanks destroyed per weapon. The course of the analysis will be the same in such computations as determination of the mean marching

rate for a division. If measurements were made for these purposes for (for example) ten sectors, the mean rate will be obtained by adding the measurements made in each of these sectors (10 + 20 + 15 + 30 + 25 + 10 + 15 + 20 + 25 + 30) and dividing the resulting sum by the number of measurements (10). It is easy to see that in this specific example the mean rate will be 20 km.

Thus, the desired mean value can always be determined using the formula

$$X_a = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n},$$

where X_a is the mean arithmetical value; $x_1, x_2, \dots x_n$ are the results of individual observations; n is the number of observations.

As the mean square value we use a value equal to the square root of the sum of the squares of the values divided by their number. It is almost always used for a quantitative expression of the degree of variability of a criterion, its deviations.

This determination can be expressed in the form of a formula

$$X_{ms} = \sqrt{\frac{x_1^2 + x_2^2 + x_3^2 + \dots + x_n^2}{n}},$$

where X_{ms} is the mean square value; $x_1, x_2, \dots x_n$ are the values of the measured perameters; n is the number of observations.

Thus, we assume that we must determine the mean square error of a range finder or radar in measurement of range to a target. The data from 10 measurements revealed that the following errors occurred in each of them: 2 m; 5 m; 4 m; 1 m; 3 m; 6 m; 2.9 m; 3.1 m; 2.5 m; 1.5 m.

$$\text{then } X_{ms} = \sqrt{\frac{2^2 + 5^2 + 4^2 + 1^2 + 3^2 + 6^2 + 2{,}9^2 + 3{,}1^2 + 2{,}5^2 + 1{,}5^2}{10}} = 3{,}4\ м.$$

The mean square deviation plays an important role in measuring the relationships between criteria, in evaluating the degree of accuracy of a selective observation, in determining the necessary population of the planned sample observation, etc.

Among the other mean values we should mention the mean chronological value, the mean harmonic value, the mean geometric value, the modulus and the median. Although these means are not needed very frequently in military science research, they are nevertheless encountered in some types of studies in the fields of military history, military economics and military geography.

The concept of all these values is given in a course on general statistics and their examination does not fall within the province of our book.

The demonstrability of a statistical study using large-scale observations i. based on the law of large numbers. This law has a rigorously scientific application only in the theory of probabilities.

The set of factors which leads to some definite results is frequently so complex that it does not make possible a precise prediction of specifically what possible results will come about in a particular case. For example, in the firing from artillery at a target one can indicate the theoretical precise place of impact of a shell, but such computations require an extremely precise knowledge of the characteristics of the gun, shell, initial velocity and atmospheric conditions, and for practical purposes this cannot be done. Accordingly, one must have recourse to determination not only of the relative probabilities of the appearance of different perameters, but also one must determine the predicted results of a greater number of tasks in the form of mean or predicted values.

Without examining the essence of various formulas in the theory of probabilities, which is the content of corresponding branches in mathematics, we only wish to emphasize that the theory of probabilities is an indispensable part of statistical solutions and is a highly important mathematical tool in studying many military phenomena. The experience in studying operational-tactical themes reveals that in the statistical processing of data one can frequently limit himself to approximate computations without recourse to the complex procedures of mathematical analysis used in special studies.

The complexity of investigated military phenomena is now so great that there is an ever-increasing need for use of computers. These machines are capable of performing an extraordinarily large number of highly different computations in extremely short times and with a great accuracy. For example, modern high-speed computers are capable of performing tens of thousands of

arithmetical operations per second and in a short time (from several minutes to several hours) can perform the numerical solution of exceedingly complex mathematical problems, whose solution would require months and years when using an ordinary calculator. Such machines can unquestionably considerably facilitate the processing of statistical data.

After generalizing indices have been found, the most important element in statistical analysis is an analysis of these indices, the explanation of the very essence of military phenomena.

In the process of explaining military phenomena we sometimes can establish a relationship between various criteria of the same phenomenon and do so at the very same time (where one criterion exists, the other is also observed); sometimes our analysis establishes the presence of a relationship between different criteria of the same phenomenon, but at different times (where one criterion appeared, another will appear); finally, a third type of relationship is that existing between two phenomena, namely, one of them causes the other, there being a cause and effect relationship.

In explaining military phenomena one must also take into account the peculiarities of generalizing indices. All generalizing indices and mean values are data in which individual differences and peculiarities are smoothed out. Accordingly, in addition to generalizing indices, the most typical (important) individual data can be of importance for practical activity. For example, in a generalizing index of the time for bringing units into combat readiness there may be "hidden" units for which the time required for combat readiness is exceptionally low; these units will constitute the greatest interest with respect to taking realistic measures for ensuring the timeliness of commencement of appropriate combat actions.

In addition, in order to be able to draw some conclusions one must study the dependence of the course and results of a statistical study on the change in the [illegible] of the investigated military phenomenon. Any battle or operation is dependent on a large number of [illegible]. Accordingly, the most important [illegible] must be selected and unimportant [illegible] must be discarded so as not to interfere with the research. Any battle or operation is dependent on changes in such perameters as changes in manpower, weapons, organization of the battle or operation, etc.

Since the examined generalizing indices, [illegible] of a battle or operation are extremely approximate, their values obtained from a practical checking can have considerable deviations from those which were obtained statistically. These deviations, if they occurred as a result of a qualitative change in individual parameters, such as better combat training of personnel, can be immediately noted. As a result of study of the influence of changes in individual parameters on the value of the effectiveness criterion, optimum values of these parameters should be established and used as a basis for formulating conclusions.

The final objective of the study of military phenomena by the statistical method is a clarification of their laws, obtaining data for predicting their development in the future, in order to introduce appropriate changes and bring about better results.

5. Solution of a Problem by the Statistical Method

The most important problems involved in the method of statistical study of military phenomena have been set forth in very general form in the preceding section. In order to visualize the sequence of statistical processing of data more clearly, we will now examine an example of the statistical solution of a problem for the selection of tactics for operations of various ships during evasion from an attacking Japanese aircraft with a kamikaze pilot as given by American statistical data [7].

The solution of this problem required answers to two questions: should a ship undertake a sharp maneuver after it has become clear that the aircraft has entered a dive or should it remain on course and rely on protection from its antiaircraft guns.

Observations of 477 cases of attack on an individual ship by an aircraft with a kamikaze pilot were collected for this purpose. The results are given in the following table.

Types of Ships	Number of attacks	Percentage of hits
Major Ships		
Line ship, heavy cruiser, light cruiser;	48	44
Aircraft carrier;	44	41
Escorting aircraft carrier, light aircraft carrier;	37	48
Minor Ships		
Destroyer, high-speed landing ship, light mine layer, high-speed transport;	241	36
Army transport, landing ship, cargo landing ship, ship carrying protecting nets;	21	43
Tank landing ship, medium tank landing ship, ship for landing tanks and amphibian vehicles;	49	22
Very small ships;	37	22
Total Number	477	36

The table shows that 36% of all the studied attacks by Japanese aircraft were successful. In the other cases the target was not damaged. It was also established that in 365 out of 477 cases the attacking aircraft was destroyed or greatly damaged by antiaircraft fire.

The observations also revealed different effectiveness of attack by enemy aircraft depending on how the ship behaved during the aircraft attack, whether it [illegible] or continued to move on its former course. The results of these observations are given in the following table.

Attacks of aircraft with kamikaze pilots	Major ships	Minor ships	Total Number
During maneuvering;			
Number of attacks	36	144	180
% of hits on ships	22	36	33
Not maneuvering;			
Number of attacks	61	124	185
% of hits on ships	49	26	34

The counts given in the table show that the percentage of hits on major vessels, such as cruisers and aircraft carriers is considerably reduced if during the time of attack by the hostile aircraft the ships perform maneuvers. It therefore follows that a major vessel must perform an antiaircraft maneuver. On the other hand, it is obviously undesirable for minor ships to perform such a maneuver because when they performed maneuvers the losses not only did not decrease, but even appreciably increased.

The reason why major ships should maneuver and minor ships should not, is partially clarified from the following table.

Operations of antiaircraft artillery	Major ships	Minor ships	Total Number
During maneuvering;			
Number of attacks	36	144	180
% of hits on aircraft	77	59	63
Not maneuvering;			
Number of attacks	61	124	185
% hits on aircraft	74	66	69

The table shows that the firing of antiaircraft artillery from large ships is identically effective both when they are maneuvering and when they are not maneuvering. On the other hand, the effectiveness of antiaircraft fire from small ships during maneuvering is sharply reduced because in this

case the pitching and rolling greatly disturbed the position of the platform on which the weapons are mounted and this greatly reduces the effectiveness of fire from antiaircraft weapons.

Thus, these data make it possible to draw an irrefutable conclusion concerning the advantage or disadvantage of sharp maneuvering for the purposes of combat with enemy aircraft in relation to the type of ship. However, it is statistically possible to establish what types of maneuvers are particularly effective and which are poor. Accordingly, a statistical analysis was made of the angle of attack of the aircraft during maneuvering of the vessel. Data on the angle of attack are given in the following table.

Attacks by aircraft with kamikaze pilots	% of hits on ship	Number of cases	Attacks by aircraft with kamikaze pilots	% of hits on ship	Number of cases
Steep dive;			Gently sloping dive;		
Straight from prow	100	1	Straight from prow	36	11
Oblique from prow	50	6	Oblique from prow	41	17
Straight from side	20	10	Straight from side	57	23
Oblique from stern	38	13	Oblique from stern	23	13
Straight from stern	80	5	Straight from stern	39	23

Two conclusions can be drawn from an analysis of the table. First, an aircraft which goes into a steep dive most frequently reaches the target during an attack which is not from the side and an aircraft diving in a gently sloping trajectory has an advantage in this case. Second, the ship is in great danger when it presents its side to an aircraft which is diving steeply and when it turns its side away from an aircraft which is in a gentle dive.

On the basis of these data the following tactical recommendations are given for evasion from attacking aircraft:

a) all ships must present their side to a steeply diving aircraft

and turn their side away from an aircraft in a gently sloping dive trajectory;

b) line ships, cruisers and aircraft carriers must sharply change their course in attempts to avoid collisions with an aircraft;

c) fleet mine layers and small ships must maneuver smoothly in order to orient themselves to the aircraft in the most advantageous way without reducing the effectiveness of their antiaircraft fire.

The statistical method can be used in solving even more complex problems. For example, it is possible to compute the needs of the army for various kinds of weapons in order to replenish losses.

For example, in order to determine the probable requirements for aircraft at the front in order to replenish their losses as a result of combat operations, A. Lagovskiy, in his book entitled "Strategy and Economics" [8] recommends the following statistical solution of this problem.

On the basis of the experience of the Great Fatherland War, the mean indices of actual losses during different periods are determined and these indices are then appropriately corrected for the changing conditions of the present day. As a result of this work, the author finds the number of aircraft missions which will occur on the average prior to the loss of one aircraft in the course of combat operations (the most characteristic index in a study of aircraft losses). In addition, the author determines the index of combat use of aircraft during the year, also expressed in the number of aircraft missions. In order to determine how many aircraft missions each aircraft must make during the course of a year of war in the theatre of military operations it is necessary to take into account a number of other conditions: how many days per year on the average on each front is it possible to conduct active attack operations; how many days is it possible to conduct defensive operations; how many days will there be a quiet on the front. Determination of these circumstances is necessary because the combat use of aircraft during each of these periods will vary greatly. Proceeding on this basis, one can determine how many aircraft missions each aircraft will make during the entire time of active attack operations, defense operations and quiet.

Then, dividing the result by the number of combat aircraft missions per loss of one aircraft, we obtain the coefficient of [illegible]

(replenishment) of the materiel of frontal aircraft operating during the course of a year.

For example, after establishing that one aircraft will be lost for every 100 aircraft mission and that the combat use of aircraft during the course of the year averages 0.80 aircraft missions per day, we obtain:
365 x 0.80/100 = 2.92, or about 300%.

Undoubtedly, the number of aircraft missions can be influenced not only by the operational requirements for the use of aircraft, but also by a whole series of other circumstances: the possibilities of material and technical supply, shortages of trained personnel, etc.

Other than combat losses, in solving such a problem it is also necessary to take into account the technical losses, and in case of necessity, also losses resulting from carelessness.

Thus, for solving such a complex problem it is necessary to make mass observations of such facts as the number of aircraft missions, the number of aircraft losses, the number of attack and defense operations, the number of days of quiet on the front, the number of failures of aircraft as a result of wearing out of parts, and a number of other factors. Then it is necessary to group all these data, prepare corresponding tables, determine the generalizing indices, and finally analyze all the resulting indices and draw conclusions for practical applications.

Undoubtedly, the method of statistical solution presented here can make no pretense at suggesting that by its use it will be possible to obtain a full picture of military losses of frontal aircraft during a future war. However, even an approximate solution of this problem can be of very great practical importance because it makes it possible to lay requirements on the national economy on a scientific basis for the production of aircraft for frontal use during the first year of a war.

The problem of approximate determination of losses of other types of weapons and military equipment can be solved in a similar way.

Naturally, in this case the units of observation and grouping of facts will differ considerably from those given above, but the principle for approach to solution of the problem will be essentially the same.

6. Limitations on the Use of the Statistical Method

The statistical method, used in study of strategy, operational art and tactics, can make some pretense to freedom from error of the rules and standards expressing the nature of the relationship revealed by the method only to the extent that they are not refuted by further observations. The conclusions drawn by the military researcher, obtained by use of the statistical method, are always limited by the number and scope of observations of objects during the course of past wars or during the course of exercises or tests of weapons and military equipment and can be applied to the future if the conditions under which the former observations and tests persist or it will be possible to introduce an appropriate correction for a change in these conditions.

The rules and standards formulated by use of the statistical method therefore are empirical (experimental) standards and rules.

The statistical method is based on large-scale observation and the counting of individual cases. If these conditions do not exist, the use of the statistical method is impossible. From this point of view a study of war as a whole and major operations is essentially impossible by use of the statistical method.

It should also be noted that it is impossible to replace a complex dialectic analysis of military phenomena with abstract-mathematical constructions which ignore the nature of investigated phenomenon. Anyone who in their mathematical construction endeavors to replace the Marxist dialectic method, rather than supplementing it, will never achieve positive results in his study.

Then all the statistical indices are obtained from some finite number of observed facts and therefore cannot be entirely reliable and experimental checking is always required. In military science the possibilities for making such checks are severely limited and this means that the conclusions drawn can be for the large part of a relative nature.

Facts in themselves can be taken for statistical research without sufficient analysis and in this case they will probably lead the researcher to incorrect conclusions rather than to a solution of the formulated problem.

Finally, the conclusions drawn on the basis of the statistical method, since they always rely on past experience, are extremely approximate conclusions. This is true, because it is known that such military events as a battle or an operation which occurred in one war will never be repeated either in the same war or in any other war. Moreover, the corrections for a change in conditions cannot be precise because our idea concerning these changes can never be complete. The difficulty in taking these changes into account and transforming them into quantitative characteristics requires a critical evaluation of the statistical conclusions for the future. Statistical data are not absolutely true and unquestionable; they are only probable to a certain degree.

Even before the First World War the British scientist Lanchester made attempts to study the course of combat operations by using differential equations. However, the Lanchester equations were applicable only to wars of a slave-owning society, when the weapons available to the sides were of the same type and combat could be regarded as a number of individual duels.

The factors exerting an effect on combat under present-day conditions are so numerous that they cannot be taken into account in equations.

Accordingly, problems involved in the field of military art cannot be solved mathematically or by the devices of mathematical logic.

The limitation of the applicability of the statistical method must also be understood in this sense that the method itself "in pure form" cannot be used. It owes its right to existence only when used directly in combination with dialectic and logic.

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Chapter V

PROCESS OF MILITARY SCIENCE RESEARCH

1. Selection of Topic for Military Science Study

The process of scientific research represents a major and complex course of creative studies, beginning from the selection of the subject and ending with an analysis of the collected materials, formulation of the conclusions and checking the research results (scheme 1).

Writing on a timely subject of theoretical and practical importance is dependent to a considerable degree on the proper choice of subject. In part this also predetermines the final result of the work.

The proper selection of a subject is particularly necessary for an author taking his first step in scientific research work. Many cases are known when a new author has not been able to write a scientific study only because he has made a poor choice of subject, has not outlined it specifically in advance and therefore has proceeded along an incorrect course. As a result, the author suffers bitter disappointment, he loses faith in his capabilities and for a long time can not bring himself to return to scientific work.

In the selection of a subject it is necessary to take into account a number of factors of an objective and subjective character, to wit: degree of personal preparation, experience in military science work, conditions and character of the service, possibilities for carrying out experiments and investigations and the availability of the sources necessary for work on the subject and the amount of time which the researcher can use for work on his subject. However, under any conditions the primary requirement must be the timeliness of the subject, that is, the correspondence to the needs for developing military theory or the tasks of insuring practical work at the present time.

The successive work on the selected topic is dependent to a considerable degree on the personal theoretical preparation and experience of the researcher. The broader his volume of knowledge and the richer his practical experience in the field in which he has a desire to write, the greater are his chances for success, the greater is the assurance that the formulated tasks will be solved. This must be taken into account both

when the researcher himself selects the topic and in both cases when the subject is prescribed by higher authorities.

Scientific research topics, such as those of an operational-tactical character, can be broken down into two groups, theoretical and applied, on the basis of their character. Theoretical subjects include such as "Tendencies in the Development of Forms and Methods of Defense", "Influence of New Types of Armament and Combat Equipment on the Character of General Military Combat", "Ways to Attain Surprise in the Conduct of Modern Operations", etc. Applied topics include such as "Breakthrough of a Prepared Defense by a Division", "Combat Use of Artillery in an Army Attack Operation", "Order of Battle for a Regiment in Defense", etc.

However, it must not be thought that topics of an applied character are without theory or that theoretical topics do not contain practical recommendations. On the contrary, the first must necessarily include theoretical validations of the specific rules, standards and methods which armed forces must use. Only under this condition can studies with such topics play the major role which they should play in insuring the practical needs of the armed forces. In turn, studies of a theoretical character must contain an investigation of definite laws, tendencies of development, and give practical recommendations. They must show the way for practical application over a more or less prolonged period of time. The dialectic relationship between theory and practice is also expressed in this situation.

On the basis of scope subjects can be classified as broad and narrow. A whole range of problems is usually considered in a broad topic whereas only one or possibly two or three problems are considered in a narrow topic.

In order to make a correct decision as to what topic should be chosen to write on the researcher must be able to determine its timeliness and realistically evaluate his resources and capabilities.

In order to orient oneself correctly as to the requirements of theory and practice and see the prospects for their development, a researcher must understand the policy of the Communist Party, study the orders and directives for combat and operational readiness and other documents, at all times be aware of the level of attainments in science in the field which he has selected and at the same time attentively observe life,

see the requirements of theory and practice, at least in that sphere where his everyday service activity transpires.

The requests for a researcher "to be given a topic" usually indicates that he lacks the requirements for creative work, that he lacks a definite idea which he could explore creatively.

D. I. Mendeleyev expressed himself as follows on this problem in one of his writings: "dissertations are written in two ways: some on the basis of practical considerations, because the author must obtain an academic degree...others are the result of thoughtful work. One author will select any old topic, just so that a dissertation will be written. Another is guided by a definite idea, begins with a small study, gradually develops and in the long run emerges as an academic dissertation. Or I can speak figuratively. One author goes along a dark labyrinth by feeling his way, possibly finds something useful or possibly runs into a brick wall. Another takes at least a small lantern and lights his way in the darkness. And as the latter proceeds on his way his lantern burns more and more brightly and finally is transformed into an electric sun which illuminates everything around him and makes everything clear." [1]

It is better for the novice researcher to select topics in both the theoretical and applied fields with a narrow character, with a limited range of the problems to be investigated. Researchers who have had much experience in scientific work must deal primarily with broad topics of a theoretical character so that these scientists will be engaged in studies opening up new paths and providing a scientific contribution to a definite field of military science and leading the young scientists behind them.

F. Engel's made interesting comments on the selection of a topic.

"In general, in all...scientific studies covering such a broad field and mass of material real attainments are possible only as a result of many years of work. It is easier to find a new and correct point of view for individual problems...but it is possible to cover all the material at once and arrange it in a new fashion only after its exhaustive processing, otherwise such books as "Das Kapital" would appear far more frequently. For this reason I am very happy that for your future literary work you

have selected topics for which despite less exhaustive study of details it is nevertheless possible to contribute something new and timely." [2]

In selecting a topic a thorough study must be made of the current status of this problem in order to see clearly what has not been adequately studied and what should be given the greatest stress. Otherwise it is possible to select a topic which has already been researched. However, this does not mean that a subject which has already been studied can not be taken for research. It is not the name of the topic which counts; but rather what will be subjected to study, that is, whether it will be possible to contribute anything new in comparison with earlier works in connection with changes which have transpired in objective reality; or a topic may be researched because there are still problems which were not covered in an earlier study or, finally, there is a need for examining problems of a particular nature from different points of view.

In some cases a topic to be researched can be assigned by a senior leader. In such cases he must always take into account the scientific background, inclinations and desires of his subordinates. However, even in this case the researcher is faced by many difficulties because he must elaborate the theme, determine the degree to which the considered subject matter is to be developed and find the correct direction for his research.

The problem sometimes arises as to whether it is possible to work at the same time on two or even a greater number of topics. The experience in scientific work shows that in most cases this is completely undesirable because it diverts the attention of the researcher. Work on any subject requires a concentration of attention on the problems involved in that topic, intense and careful work on these problems. However, in individual cases simultaneous work on two topics is sometimes done, particularly by those individuals for whom scientific work is their permanent and basic form of work. In such cases success is dependent on correct planning. It is impossible to work when constantly jumping from one topic to another, without really concentrating on one subject or the other. The switching to another subject must be a sort of "active rest" or a method for letting one's thoughts on the previous subject "to settle". A switching to another topic can also be caused by objective conditions, for example, because it

is impossible to obtain the required materials on the particular subject at a particular time.

However, it must be emphasized that the recognition of the admissability of simultaneous work on two topics in individual exceptional cases does not mean that this situation can be considered normal. On the contrary, it must be emphasized very strongly that leaders who simultaneously delegate several scientific studies to a single person, particularly to one who does not have a great amount of experience in conducting military science studies, committing a great error. An equally great error is made by those new workers in the field of military science who literally seize on any topic for research and select so many topics that not one of them can really be turned out in finished form. It is wise to bring to the attention of such workers that in science there has never been a case when "rapid thinkers", who regard themselves as capable of solving any scientific problem "along the way" have succeeded in making even a small scientific discovery. The person who wishes to become a worker in the field of military science and contribute any small good to military science must not deviate from his selected topic until it is completed and at least some small scientific results have been obtained. Naturally, this does not mean that he must be engaged in nothing other than work on his scientific topic. On the contrary, both everyday service activity and party and social activity, as well as studies in the broad sense and cultural rest are not only not an interference, but an indispensable condition for successful scientific creativity.

The proper formulation of the theme is of great importance. A well-formulated theme for the study affords the possibility of defining its fundamental content by name. In order to select the most suitable title for a study it is first necessary to define clearly what problems will be discussed. For example, if the conditions and all the basic problems in organizing and conducting pursuit by combined arms units are considered in a study, the name of the article must be made more general: "Pursuit of the Enemy by Combined Arms Units". However, if a study deals with such a topic as the organization of forward detachments alone and their actions during pursuit, the name of the study must be more specific: "Forward Detachments During Pursuit".

Later, during the work, the name of the study can be made more precise. This is usually done because during the time of work on the subject it becomes clear that there is need for additional consideration of a number of problems which were not taken into account earlier; on the other hand, there may be a need for dropping consideration of some problems.

2. Calendar Plan for Work

The success of any kind of work is dependent to a considerable degree on its proper organization. This rule fully applies to work in military science. For the proper organization of work on a topic it is of great importance to prepare a well-elaborated calendar plan. The calendar plan gives order to the work and insures clarity in the work that the study will proceed in an organized fashion. A well-devised and carefully prepared plan, which takes into account all research stages, is one of the means for increasing the productivity of work and is a guarantee that the topic will be completed in the required time.

The calendar plan stipulates specific times for completing different stages in the writing of the study; this favors the development of discipline and tenacity in the work and guides the researcher in working systematically, adhering to a strict agenda and making more productive use of his working time. Systematic work on the subject, daily or with brief gaps dictated by the nature of day-to-day service activity, is of great importance. Researchers, particularly those inexperienced in scientific work, frequently make a mistake, assuming that when they have only brief periods of time free of their day-to-day service it is undesirable to work on their topic.

It must be remembered that scientific progress requires a systematic and constant mobilization of the researcher for completing his topic. Accordingly, daily work on a topic for only one or two hours can yield a greater result than work several days in a row but with longer interruptions. In some cases it is adequate to have only a half-hour per day in order to write down observations or thoughts relating to the topic or to read a newspaper or magazine article dealing with one of the problems relating to the investigated topic. Obviously, even such a small expenditure of time plays a very significant role because the researcher's thoughts will be constantly riveted on his selected scientific topic. If the interruptions are longer, however, the researcher will be required to return to what he has already

done in every case, especially if he has a poor memory; then, as they say, he has lost the thread of his thoughts and precious time will then be expended unproductively.

When there is an intelligent organization of the work even a brief time segment can be employed with profit. Anyone who wishes to become a worker in the field of military science must teach himself to appreciate the value of each minute of working time. Even the shortest time intervals used productively over a more or less prolonged period will yield a good result. Thomas Mann expressed himself very well on this point: "Keep track of time! Guard every hour, every minute! ... Account for every day, account for every minute. Time is the only thing for which stinginess is praiseworthy" [3].

The classical writers of Marxism-Leninism, as well as leading scientists in different fields of science, felt that planning of their work was of enormous importance. In their writings one can find repeated mentions of the need for a well-devised preparation of plans. [illegible] planned his work very clearly and precisely adhered to the time for its completion. In one of his letters to K. Marx he wrote: "Do as I do. Set yourself a time when you must be ready and make every effort that it be done before then" [4].

It is now difficult to find any scientific worker who has not drawn up a calendar plan for his work. However, this applies only to those workers for whom scientific work is their service job. However, the preparation of a calendar plan is sometimes neglected when performing work on one's own initiative. This is a great error. A calendar plan must be drawn up in all cases, regardless of whether or not scientific work is the researcher's basic job.

The existence of a calendar plan is not only advantageous to the researcher himself, but enables the director to check on the work of his subordinates during their research on a topic.

Thus, the preparation of a calendar plan is a necessary and important stage in work in military science and its preparation must therefore be approached very thoughtfully. There is nothing worse than when a plan prepared without taking into account all the peculiarities of the topic to be researched and the specific conditions under which the researcher is working is not carried out. This leads to a disruption in the work

time and sometimes the job is never done. In such cases the researchers have shown a negligent attitude toward planning and this does not favor their acquisition of such an important quality as the ability to work systematically and carefully.

A calendar plan is prepared after a subject is selected for the entire period of the work, from beginning to end. It must make provision for all stages of work on the subject and stipulate the times when they are to be done.

Since all studies in military science are of definite interest and value, it is desirable that the plans be drawn up in such a way as to insure intensive work on the subject, that is, so that it will be completed in the shortest possible time.

The classical writers of Marxism-Leninism devoted great attention to the intensity of work. For example, K. Marks devoted ten hours a day to economics and devoted his free hours to higher mathematics.

However, the beginning scientific worker must take care to prevent the rash and thoughtless step of drawing up a plan involving a working day of excessive duration with deadline which will fall too quickly. It is necessary to economize time, but at the same time the objectives must be within his capabilities and the working day must be increased gradually.

Officers and generals who are not working at scientific institutions must take into account the time required for performance of their basic military duties when they draw up their plan.

All the stages in work on the topic provided for by the plan must be laid out in such a way as to ensure a definite sequence in the work. The latter is dependent to a certain degree on the experience of the researcher and the work methods which he adopts, the nature of the topic, what sources are to be used, and a number of other factors. The following sequence of research on a topic in military science is most typical:

-- selection in study of the literature, including descriptions of exercises, and in case of necessity, archival materials as well;

-- preparation of a working or systematic plan for the study in military science;

-- participation in army exercises, visits to the archives and to various scientific organizations, formulation of an experiment (depending on the nature of the subject);

-- processing the collected materials and writing a scientific report or a study intended for publication;

-- discussion of the work and elimination of shortcomings appearing in the course of the discussion.

Study of the literature is of great importance. As much time as is required for a complete study of everything meriting attention from what has been written on the selected subject must be devoted to this purpose. Otherwise, subsequently it will be necessary to return again and again for additional study of the literature, this resulting in an unproductive expenditure of time. Study of the sources in the literature also makes it possible for the researcher to extend his knowledge on the subject which he is investigating. However, this does not mean that during the writing up of his topic it will no longer be necessary to study the literature on individual problems. This will have to be done, particularly doing a long-term project, because it is necessary to keep abreast of the newly appearing literature relating to the investigated topic and study it.

Time for the study of the experience of army exercises and archival materials, for trips to various scientific institutions and formulating and executing experiments is planned in accordance with the nature of the subject of the military science research.

The greatest amount of time is usually allocated to working up the collected materials and writing the study itself. Since during this stage of the work it may be necessary to make additional trips to the field army, archives, etc., a certain amount of time must be allocated for this purpose.

When writing a dissertation, the calendar plan must also make provision for time for the preparation of graphic materials and the preparation and defense of the dissertation.

Depending on the nature of the study in military science, the time can be allocated by quarters, by months, by weeks or even by days. In the writing of major works in military science, monographs or dissertations in other

military science studies whose finalization requires a great amount of time, it is desirable that the calendar plan be prepared by quarters or by months. For writing an article or summary with a time limit of one or two months the calendar plan can be drawn up by weeks. Moreover, at the beginning of the working day the researcher must determine how much work will be accomplished during the day.

3. Preliminary Familiarization with the Literature and Preparation of a Working Plan for a Study in Military Science.

A preliminary familiarization with the sources in the literature is an essential initial stage in the process of research in military science when writing on a selected or stipulated topic. This is a sort of "reconnaissance", and the more carefully it is done the better will be the progress. This familiarization makes it possible to determine what literature is available on the particular topic and what the nature of this literature is; it also provides material for the preparation of a working plan for a study in military science.

The modern literature on military art is very extensive and varied. The appropriate literature must be sought out and selected in order to study everything which is important and known on a particular topic. This is no easy matter and requires certain skills.

A bibliography is of assistance to the worker in military science when selecting the literature.

Each military researcher must make use of all available bibliographic materials in his scientific work. Military libraries have catalogs and various bibliographic aids such as guides, recommended lists of literature, card catalogs, etc., for assisting the reader in getting a clear idea of the book resources and aiding him in selecting the necessary literature on various questions.

Major libraries specializing in military science publish monthly bulletins of new acquisitions as well as bibliographic indices of literature in the fields of military history and operat[illegible]ns and tactics. For example, the bibliographic indices published by the library of the Military Academy Imeni M. V. [illegible] list books, magazine and newspapers articles dealing with the Marxist-Leninist theory of war and the army, history of military art,

strategy, operational art, tactics, combat readiness, Party-political work, and the principles of military education. All these aids constitute the so-called bibliographic reference system whose purpose is to assist the reader in graphically and correctly selecting the necessary literature.

Library catalogs are the basic tool for familiarizing the reader with the available books. A person cannot be oriented in the richness of human thought which has been incorporated in books without the availability of a catalog. The ability to work with books is an essential skill for the scientific worker.

Catalogs are of different types: alphabetical, systematic and subject.

An alphabetical catalog lists the book resources of a library using the author's name as the cataloging criterion. The basic purpose of an alphabetical catalog is to answer the following questions of a reader: does the library have a book whose author is known to the reader; what writings of a particular author are available in the library.

A systematic catalog familiarizes the reader with the range of books in the library and assists him in selecting literature on various branches of knowledge and individual problems. All the materials in this catalog are arranged in a definite system, by branches of knowledge. Each branch of knowledge constitutes a section such as: "History", "Philosophy", etc. All these sections of the systematic catalog are divided by headings and the latter are divided by subheadings. For example, the heading "military art" has the subheadings "strategy", "operational art", "tactics".

A subject catalog makes it possible to find a book on a specific subject or problem (for example, "Meeting Engagement", "Pursuit", "Attack with River Crossing", etc.).

In order to use bibliographic aids in practical work and to be able to employ them, it is important to know the basic types of bibliography, at least in their general outlines.

A current bibliography is based on the lifting and reporting of all printed matter published during a particular period either for individual branches of knowledge or for types of publications (books, magazines, newspapers, etc.). The currently appearing literature is listed and recorded by the All-Union Book Chamber and the bookchambers of the various union republics. The most important sections for bibliographic listing are: "Book Chronicle",

"Chronicle of Newspaper Articles", "Chronicle of Reviews", etc. In particular, these publications report all the open military literature appearing in the Russian language.

An information bibliography has the purpose of familiarizing the reader with the new contributions to the Soviet and foreign military literature. For officers interested in new contributions to the foreign military literature the Military Section of the Library Imeni V. I. Lenin publishes a special bulletin entitled "Foreign Military Literature" giving information on the most important new books which have been published and on articles published in the open foreign press.

Moreover, officers and generals engaged in work in the field of military science find it extremely useful to use the abstract journals published by the Institute of Scientific information of the Academy of Sciences USSR for different branches of knowledge. These journals give not only a bibliographic description, but also a detailed exposition of translated articles.

A retrospective or composite bibliography, in contrast to a current bibliography, listing new publications which have just appeared, covers the literature on some subject or branch of knowledge during a particular historical period, such as the "Bibliography on the Fatherland War of 1812 for 100 Years (1812-1912)".

A special subject index for some subject over a long period can be of inestimable assistance to an officer researcher in his study of the literature. When such an index is available for the need for seeking out the literature from other bibliographic sources no longer exists.

Many workers in the field of military science, particularly those who are engaged in work on the history of military art, must turn to the pre-Revolutionary Russian literature. Old pre-Revolutionary bibliographic indices can be of great assistance in this case. Among them the most important which should be mentioned are the "S. D. Maslovskiy Systematic Catalog" [5], consisting of two volumes (first and third), each listing 4,000 titles of books in the Russian and foreign languages, as well as the Berezovskiy catalog [6], consisting of 36 annual numbers, each containing up to 1,000 book titles. A review of the products of the most important military writers and military leaders from the time Ancient Greece and Ancient Rome to the beginning of the

19th century can be found in the book entitled "Experience of a Library for Military Men, Second Edition" [7]. Such studies as the "Systematic List of Writings on Various Branches of Military Knowledge", edited by Colonel Stankevich (St. Peterburg, 1878). The Bezgin "Military Bibliographic Index" (St. Peterburg, 1902) and others are of definite interest to military researchers.

In addition to special publications of bibliographic indices, bibliographies on various problems can be found within books (in textbooks, manuals, monographs, in collections of documents and other types of publications), as well as at the end of some articles. For example, in the collection of documents entitled "A. V. Suvorov" (Vol. IV) one can find one of the most complete bibliographies concerning Suvorov, listing more than 2,000 titles of sources. A major bibliography of articles on the Fatherland War of 1812 is given in Volume 31 of the Large Soviet Encyclopedia.

It is also necessary to use the lists of all articles published during the year which are given in recent numbers of military journals and collections of articles. In this way it is possible to make the most complete coverage of all the literature on an investigated subject.

Libraries render great assistance to authors in selecting literature. The State Library Imeni V. I. Lenin, the Library of the Central House of the Soviet Army and the military science libraries of the military academies and others afford such assistance. At the request of generals and officers they prepare the required bibliographic summaries and lists of the literature on various topics.

However, despite the fact that scientific libraries can select literature on a particular subject, the author's own work is not less important. In the last analysis only he knows what will be suitable for his work and what can be omitted. For this reason, every officer working on any scientific problem must know the basic rules for describing books and articles in journals, collections of articles and newspapers. The proper description of a book facilitates the library work in finding it and is also necessary when preparing the lists of literature used which are usually appended to such studies.

For his preliminary examination of the literature the researcher prepares a bibliographic list of books, magazines and newspapers on the selected topic

and depending on their number and importance he sends an order (orders) to the corresponding library.

The catalog cards give an index, that is, a numerical key to the section to which a book has been assigned and an author key in accordance with special tables. The index and author key form the book's nomenclature, determining its position on the library shelf. For example, if the card gives the number V542/D-788, the numerator V542 represents the section "general tactics" and the denominator D-788 is the author key for M. Dragomirov. In order that it will not be necessary to return to the card catalog again and again it is desirable that the researcher write down the numbers of those books which must be used most frequently.

If an officer or general engaged in military science work is on duty far from the scientific centers of the country he nevertheless has the opportunity to obtain the literature which he requires from many scientific libraries by mail. So-called interlibrary loan exists for this purpose. If one desires to obtain required literature it is necessary to affiliate oneself with one of the regional libraries and receive the necessary books, magazines or microfilms through it from the central libraries.

The preliminary familiarization with a book should be done in a definite sequence. First it is necessary to read the title page of the book, which gives its name, the author's name, year of publication, place of publication and editors. Next it is necessary to examine the table of contents; this gives some idea of the basic questions considered in the book and the arrangement of the material.

The next step is to become familiar with the forward and introduction, reading them fully or in part. The forward may be written by the author, an editor, the publishing house, the translator or a leading specialist on the subject discussed in the book. The forward usually contains preliminary explanations and comments on the book, discusses why it was written and familiarizes the reader with the sequence of arrangement of material, the basic problems involved in the work and the characteristics of exposition of some of these problems. The forward also makes clear the general character of the book and indicates the possible range of readers for which it was intended, as well as defining the limits of study of the question. If the book is not

a first edition, the forward indicates what changes have been introduced into the book and how the new edition differs from preceding ones. A. M. Gor'kiy stated that forwards are written in order to facilitate the reader's sustaining interest in a book.

After familiarization with the forward (introduction) the reader should examine the summary and fleetingly go through the entire book, reading selectively only individual places and determining what the book can contribute to his research.

The character and method of selective reading are dependent for the most part on the book being examined. However, there are several general rules which should be adhered to in this procedure.

1. The selective reading of the text should involve an examination of the table of contents and other elements of the book. In the examination of the table of contents it is necessary to note those chapters and sections which may be of greatest interest for clarifying the problems in the investigated subject.

2. Particular attention must be given to the introduction and summary (or to the first and last chapters of the book), that is, to those parts of the book in which the author clarifies his approach to the investigated problem or formulates his conclusions. Although the material which the author relies on, the sequence of development of thoughts and the course of demonstration may still not be entirely clear from the preliminary familiarization with the book, the basic positions of the author and the results of his research should be quite understandable.

3. In the examination of individual chapters and sections attention should be given to generalizing statements, those places which stand out due to different sizes of type (wide spacing, italics, etc.), because the author himself emphasizes these points and obviously is calling upon the reader to give them attention.

While examining and reading the text it is necessary to become familiar with the figures and illustrations, as well as other graphic materials: diagrams, sketches, tables and maps. The presence of diagrams and sketches assists the reader in better visualizing the described phenomena, military events, various kinds of structures, etc.

In addition to the graphic materials, during examination of the book the reader should give attention to auxiliary materials, such as subject and name indices, comments and notes. The bibliographic references given in books are also very important. This type of bibliography incorporated within a book can assist the author in selecting new books on this subject not known to him before.

Familiarization with a book makes it possible to determine its general content and plan how it is to be used in subsequent work.

After first examining the sources in the literature, it is necessary to write down all thoughts, questions and comments which arise. It is recommended that book marks be put in those places where the reader should return for more thorough reading.

If a newspaper or magazine article is involved, rather than a book, and therefore there is no table of contents, it is necessary to run through the entire article quickly in order to determine the basic questions with which it deals.

Preliminary familiarization with the literature results in a broadening in the field of research. New, earlier unforeseen aspects of a topic are discovered and the researcher better understands his objective and goal and can proceed to formulate his working plan for the study in military science.

A working plan is the skeleton of the entire study. It must include a formulation of the basic research problems, headings and subheadings of its individual parts, chapters, sections and subsections.

It goes without saying that this plan will have a preliminary and rough character. However, the availability of such a plan is strictly mandatory. The work cannot be undertaken without such a plan. Without a plan a researcher will not know where he is going, what he requires and what results he is seeking. A scientific worker will never produce a valuable study unless he has a thoroughly thought-out, written plan.

In discussing the importance of a working plan for scientific research, it is fitting to recall the remarkable words of Karl [illegible] "A spider performs operations resembling the operations of a weaver and a bee, in constructing his waxen cells, puts some human architects to shame. However,

even the worst architect differs from the best bee from the very beginning in that prior to constructing his waxen cell, he has already constructed it in his head. At the end of the work process there is a result which even at the very beginning of this process existed in the worker's mind, that is, ideally" [8].

Writers, like scientists, give great importance to the preparation of a working plan. Turgenev writes: "I am now engaged in drawing up a plan, a rather tiring job, since no visible traces will remain of it . . . ". (Dostoyevskiy wrote: "The plan is the most important thing, and the work is the easiest part. When there is a plan you know how to collect the material" [9].)

A successfully prepared working plan considerably facilitates the researcher's work. However, any error in the plan has a negative reflect on the course of the work. A poorly prepared working plan frequently results in collapse of the work and fruitless expenditure of energy and time. Accordingly, the most serious attention must be devoted to preparing the working plan. The more extensive the study in military science, the greater is the number of persons participating in it, the more important is the task of preparing the working plan and the more carefully must it be worked out and discussed.

In preparing a working plan it is very important to formulate the objective of the research, its scientific goal, correctly, concisely and clearly. The correct formulation of the objective ensures the necessary breadth and depth of the research and its purposefulness. This is also important because in the event of an unclear, or particularly an incorrect formulation of the objective, the researcher risks doing work in an incorrect way, wasting time and expending excess work.

It goes without saying that in formulating the basic objective the researcher must adhere to it to the end of his work; this must also be reflected in a corresponding formulation of the chapters and sections, as well as in the conclusions. Only in this case will the research have the necessary purposefulness.

In preparing a working plan it is also necessary to determine the approximate length of each section, chapter and part, as well as the study as a

whole. If the topic requires any peculiarities in the research methods this method must also be set forth in the working plan.

After the working plan has been drawn up, it must be discussed, for example, at a meeting of the department, section or discussion circle at the military science society. Group discussion can be of great profit to the researcher. The plan is approved after details and thorough discussion.

When the working plan has been drawn up, the structure of the study, its objective, basic research problems have been determined, the researcher can then proceed to the next stage in the process of military science research, that is, to the collection and analysis of the data, materials, printed and archival sources which are required in the study.

Methodological plans are prepared when formulating major group studies. A methodological plan broadly covers the problems involved in mutual work of the authors of different parts of the collective study. It, like the working plan, must be an organizational document which gives all the stages in research, their content and the precise times when they will be completed.

4. Study of Scientific Literature

After drawing up the working plan and clearly formulating the objective of the study, the military science researcher proceeds to collect the materials relating directly to the selected topic.

This stage in the process of military science research is one of the most important. It governs the success or failure of the scientific study. Without collecting the materials and factual data required for the study one cannot develop the topic or draw any conclusions or generalizations.

The sources which supply military science with facts and ensure the development of military theory during peacetime are: exercises with the armed forces, war games, command and staff exercises, maneuvers, tests of equipment at proving grounds, archival materials providing information on past wars and various kinds of scientific literature: books, magazines, dissertations, abstracts, orders, instructions, etc.

Despite the enormous importance of experience of exercises with the armed forces, war games, archival materials giving information on past wars, the collection of material must nevertheless begin with a study of the published

sources. This is primarily important in order to clarify the extent of scientific work on the investigated problem available in the literature, the status of scientific knowledge in the particular field, so to speak "the last word" of military science in this field; in addition, it is necessary in order to be able to approach the primary materials, including archives, in a purposeful and critical way during subsequent analysis.

If he does not have the literature, the researcher is unarmed for a critical approach to an evaluation of archival sources. At the same time, he will be in difficulty in selecting any operations and battles from the experience of past wars and will be unable to determine whether various archival documents or combat examples have been used in published sources and what conclusions from past combat experience has been drawn by earlier researchers.

Among all the sources in the literature it is the book which is most important[1]: Books contain the entire sum of human knowledge; they tell of all the experience accumulated by mankind and all his scientific achievements. A book is a source of knowledge, a key to learning the laws of nature and society. A. M. Gor'kiy acknowledged that he owed everything which was good to books; books gave him the joy of knowledge and culture and he could not speak of books otherwise than with the most profound excitement and joyous enthusiasm.

Every officer or general engaged in military science work must devote great attention to study of the scientific literature. This study must be conducted both for the purpose of broadening his general military point of view and for the purpose of finding the materials necessary for conducting current scientific work in the investigation of some particular topic.

The study of the literature for the purpose of deepening his scientific knowledge broadens the researcher's point of view and lays a solid basis for a profound study of a particular topic. Experience shows that if a systematic study of the literature covering all the basic aspects of military science is not ensured it is inevitable that there will be unpleasant failures in both practical and scientific activity.

[1] See p. 262

It is necessary to adhere to a definite sequence when supplementing one's knowledge. Academician I. P. Pavlov spoke very instructively on this point: "I can never speak on this highly important condition for productive scientific work without excitement. Sequence, sequence and sequence. From the very beginning of your work teach yourself to adhere to a strict sequence in the accumulation of knowledge. Study the rudiments of science before attempting to scale its peaks. Never take on something new without having mastered what has gone before. Never attempt to cover up shortcomings in your knowledge by even the boldest guesses and hypotheses. However much the soap bubble enchants you it will inevitably break and you will be left with nothing but confusion" [10].

In studying the literature for the purpose of broadening and deepening one's military knowledge, it is particularly necessary to keep a constant watch on the current military literature, new books on military topics and military journals, both Russian and foreign (at least translated ones). Military theory journals and individual studies reflect the level of military knowledge attained during a particular period, make attempts to generalize the influence of new combat techniques and equipment on the character and methods of waging war, combat and operations, formulate serious problems for solution and reflect the experience in practical activity in the armed forces. The systematic study of the current military literature makes it possible for the researcher to keep in step with the life of the army, enriches its theoretical knowledge and assists in clarifying unsolved problems of great importance for the armed forces.

However, in order to have a broad military point of view it is impossible to confine oneself solely to the present-day scientific literature. Without fail it is necessary to find the time and opportunities for familiarization with old studies written by outstanding military theoreticians and commanders of the past, as well as with the most important official manuals. A thorough study must be made of the history of development of military art as a whole, and especially the experience of past wars. A knowledge of the history of military art is obligatory for the worker in military science because without this his work in military science cannot be productive.

"All the laws of waging war or military theories having a basic character are a generalization of the experience of past wars drawn by our predecessors

or contemporaries. These lessons, paid for in blood, transmitted to us by the wars of the past, must be given serious study" [11].

In forming his scientific point of view, the young scientific worker must make a thorough study of Marxist-Leninist philosophy, dialectic materialism and the science of war and the army in order to ensure a correct methodological approach to the solution of scientific problems. This requires much independent work. It goes without saying that it is best to study courses in Marxism-Leninism in the university; this should be done during the first years of his scientific work.

In addition to study of the literature for the purpose of developing his knowledge, every officer and general engaged in scientific work must make a special study of the sources necessary for conducting the current scientific work on the topic selected for research.

A scientist must work by "standing on the shoulders of his predecessors". This means that he must study all, or at least the greater part of the literature on the investigated problem in order to have a good familiarity with its scientific development. The researcher must not neglect old books, journal or even newspaper articles. Sometimes the scientific worker can find valuable facts and data for confirming his own thoughts or arguments or refuting these thoughts by reading the old literature.

A thorough study of the literature on the selected topic safeguards the military scientific worker from "discoveries of already discovered Americas" and also assists him in refuting incorrect and outdated points of view. Moreover, it makes possible a thorough clarification of the process and establishes patterns and tendencies in the development of the investigated phenomenon, determines the influence of the means of combat and other factors on this development, clarifies the method for approach to the study, proof, etc., and also the present-day status of the investigated problem and its unsolved aspects.

For example, an officer was assigned a goal of studying a meeting engagement under modern conditions. A study of the sources in the literature relating to this topic assists him in clarifying when and under what circumstances this particular type of combat developed, its characteristic features, peculiarities in organization and execution, conditions for achieving success, what evolution this type of combat has undergone, what is new in the methods

for its conduct in relation to changing conditions and the character of armed combat and when these changes occurred. By analyzing the experience of a number of wars, particularly the First and Second World Wars, as well as the postwar development of combat techniques and armament, he can establish a definite continuity, a sort of pattern and the principles in the methods for organizing and conducting this type of combat.

It is entirely obvious that if all the theoretical and practical heritage which has been left us by earlier researchers who have studied this particular military phenomenon has not been studied it will be impossible to make a thorough analysis of this phenomenon and draw any useful scientific conclusions.

The clearest example of scientific conscientiousness, thorough study of the literature on an investigated topic, ability to make maximum use of all the material in the literature, and on this basis raise a study to a level not obtained by earlier writers is the work performed by the geniuses of mankind Karl Marx and Vladimir Il'ich Lenin, these men of genius, scientific revolutionaries, leaders of the world proletariat, are not only the teachers of a new point of view, the founders of scientific Communism, but also a model of how to perform scientific work. Marx, in answering his daughter to a domestic inquiry as to his favorite occupation, wrote: "favorite occupation -- digging in books". Engels wrote about the scientific conscientiousness of Marx, that it ". . . did not permit him to publish his conclusions in systematic form before he was himself satisfied with their form and content, before he was finally convinced that he had read every book and had weighed every objection and that he had exhausted every problem" [12].

In his preparations for "Das Kapital" Marx read and abstracted more than 1,500 books and his comments on notes on economic questions alone filled up to 800 printed pages. Marx abstracted the basic sources in the literature three or four times, in each case with a new point of view. When "Das Kapital" was already almost completed Marx learned of the publication of a new book on economic questions and although he expected to gain nothing significant for himself from this study he asked Engels to acquire this book for him: "My theoretical conscience does not permit me to write further without familiarizing myself with it" [13], he wrote to Engels.

V. I. Lenin used an equal number of books in writing his scientific studies. The comments and notes included in the "Tetradai po Imperializmu" (Notebooks on Imperialism) alone occupied 43 printed sheets and formed a book of 739 pages. Vladimir Il'ich made notes from 148 books for his study on imperialism (106 in German, 23 in French, 17 in English), as well as 232 articles published in 49 periodicals. In preparing the book entitled "Development of Capitalism in Russia" Lenin used 583 books in Russian and foreign languages. In his work entitled "Materialism and Empiriocriticism" there are citations to 40 sources in the Russian language and 200 sources in foreign languages.

Work on sources in the literature requires definite skills and habits. Much special literature has been devoted to this question. Accordingly, in this monograph we limit ourselves to an examination of only some of the fundamental precepts concerning the desirable organization of reading.

One must distinguish the reading of books for the purpose of increasing one's knowledge and in the interest of scientific research, there being a significant difference between them. This difference is determined by the fact that for a researcher a book is not a textbook and not a source of esthetic pleasures, but primarily a source of material. Accordingly, the researcher is usually interested not in the book as a whole but in its discussion of individual problems.

When reading in the interest of a scientific study of any problem it is necessary to begin reading with those books which provide the greatest amount of necessary material. This facilitates the study of all other literature to be read. No book should be read completely; only those sections, chapters and even pages which are necessary for the particular topic need be read.

The creative work of a researcher with a book or articles assumes a study of the material. That is, a deep understanding of the content, a clear comprehension of the fundamental points and conclusions and determination of their relationship to what has been read. In the course of the study it is very important to comprehend the basic thoughts which the author sets forth; it is necessary to clearly establish the key theses, conclusions, generalizations and overall conclusions which are present in the study; it is necessary to grasp the course of reasoning and proofs in order to understand what the

author is getting at and what arguments and factors he presents for this purpose and how his reasonings are formulated.

The external appearance of the text to a certain degree is of assistance in finding the key thoughts expressed by the author in the book: heavy type, underlining, such words of the author as "first", "second", "finally", words indicating the enumeration of arguments in support of points which have been set forth, exposition of reasons, etc., or such words in the text as "thus", "therefore", "accordingly". They are signals of generalizations or conclusions which are to follow. Reading with close attention to such places in a book affords the possibility for better penetrating into the essence of the content of the material.

Work on a book is a particularly creative process.

Every scientific worker must develop the ability for critically viewing everything which he has read, correlating it with his own ideas and plans.

Study of the sources in the literature and the process of independent creativity are stages of work inseparable in time. The process of independent scientific creativity already occurs in the course of study of the sources. During reading it is not only necessary to merely remember what has been written, but critically examine the author's point of view, taking into account one's own conclusions and generalizations, judgments and evaluations. The most important consideration in reading is not only becoming familiar with factual material, but also the stimulation of one's thoughts and ideas. Classes on critical reading, taking on faith everything which has been read, can negate the author's individuality as a scientific worker, particularly a young one, and can impede his development in the field of independent thinking.

Remarkable examples of a creative and critical attitude towards studied literature have been given by V. I. Lenin. In studying bourgeois authors, Lenin frequently recalculated their calculations and checked their citations to sources. Lenin's comments on the margins of book pages and his synopses of books which he had read are of enormous value for every scientific worker.

The scientific literature contains foreign words, special terms, scientific concepts and unclear expressions and thoughts. It is inadmissible that they remain unclear. For this purpose when reading the scientific literature

one should have at hand a number of dictionaries ("Dictionary of Foreign Words", "Concise Dictionary of Operational-Tactical and General Military Terms", "Naval Dictionary" and others).

If the required dictionary is not at hand, anything which has not been understood must be written down and more experienced comrades consulted for an explanation. This will facilitate the further development of the scientific worker's point of view. However, if the reader passes over unclear words, expressions and thoughts without understanding them, this results in superficial thought and understanding.

Sometimes after the initial reading much of the book's content remains unclear. It must be remembered that in many cases what has been read becomes clear only in the light of subsequent chapters or sections of the book or when the book is read again.

In his lecture presented in 1919 to the students at Sverdlovsk University, V. I. Lenin explained the methods for assimilating the work of F. Engels entitled "Origin of the Family, Private Property and the State": "Undoubtedly, in this paper not all parts are equally understandable and presented with equal clarity: some parts assume that the reader has historical and economic knowledge already in his possession. However, I again say: there is no reason for embarrassment if this paper is not understood at once when it is read. Hardly anyone ever understands it so readily. However, upon returning to it at a later time, when the interest has been aroused, you will find that you will understand most of it, if not all" [14].

V. I. Lenin advised his listeners to make note of passages which were unclear or not understood in their reading so that they could return to them a second, third or fourth time so that what still remained unclear could be clarified and understood with subsequent reading: " . . . what was not clear during the first reading will become understood during a second reading or when you approach the problem at a later time from a somewhat different point of view . . . " [15].

Three basic methods can be recommended for a study of the scientific literature: 1) scanning, 2) continuous reading, 3) study. The scientific worker must be able to use all three reading methods, depending on what book is being read at a particular time and for what purpose.

A researcher scans a book when after first familiarization he becomes convinced that the book is of no value for him. In this case the reading of the book is replaced by its rapid scanning, that is, the quick scanning of individual pages with examination of the figures, diagrams and drawings. Sometimes such a rapid examination ends with a return to some interesting places in the book for slow reading.

During continuous reading the book is read without haste and with complete attention, the entire book from beginning to end. Reading must be done in sequence, without omitting notes or footnotes and studying the tables, diagrams and sketches.

The study of the book is its profound assimilation. It requires great concentration and assumes a complete mastery of the book content. It is desirable to master a book by individual chapters so that certain conclusions can be drawn from each of them. Study is usually accompanied by various kinds of note taking, writing down of one's thoughts and a concise synopsis of the entire content of the book.

In order to facilitate the mastery of the material, during the course of reading of the book notes should be made in pencil on the margins, using various symbols and abbreviations.

However, it must be remembered that such notes can be made only in one's own books; when library books are being used it is necessary to employ book marks and make the notes on them. Special care must be exercised when using a book from the library. Notes made in a library book not only make it messy, but also hinder subsequent work because they confuse the reader's thought, distract his attention from the text and hinder concentration. It must also be remembered that notes on the margins of a book are inadequate for the collection and subsequent processing of material. Accordingly, when working with a book, studying it, note taking is mandatory. Anyone who simply reads is comparable to a butterfly; the person who reads and takes notes can be likened to a bee.

Notes are of assistance in thoroughly penetrating into the sense of the material because they require a careful analysis and generalization of what has been read and determining the relationships between individual parts of the material. The very process of writing up notes activates the mental

activity and concentrates attention on what is primary, what is most important, what is necessary for the researcher for his scientific work. Earlier studied material always can be brought back to mind without difficulty by readings one's notes.

The principal requirement when making notes is accuracy and neatness. In the notes the thoughts must be expressed literately, correctly, concisely, clearly and soundly. Carelessness cannot be allowed in taking notes on the content or in the external format of the material. Any negligence in spelling, particularly lack of attention to the use of puncutation marks, inevitably leads to errors in meaning and a decrease in the value of the notes which have been made.

Before writing down the necessary information from a book which has been read it is necessary to note its bibliographic data: the author's initials and last name, full name of the book, place and year of publication, name of publishing house and total number of pages. Sometimes, if necessity dictates, the following additional information can also be indicated: possible source from which the book (journal) can be obtained, library number, number of copies printed, price, etc. If the note is taken from a journal or newspaper article it is necessary to note the number of the journal (newspaper) and year of publication. Such a note on the source of information always makes it possible to check data and sometimes reeavluate them in connection with a criticism of the source from which they were taken.

Depending on the purpose of the reading and the value of the source, notes are taken on the most important numerical data, citations, basic assertions, generalizations and conclusions drawn by the author. Notes are also taken on facts, events and examples which the author cites for demonstrating his assertions, reasonings and arguments by means of which he validates the correctness of his assertions. The conclusions formulated by the author are one of the most important sources for writing notes on a book which has been read.

During the course of work with a book the researcher selects and analyzes different kinds of information contained in the book in the necessary sequence, for example, the percentage of losses from various kinds of weapons during different epochs, the effectiveness of individual combat weapons under different conditions, indices pertaining to the scope of operations, etc. This

information is noted in the form of statistical summaries, tables, lists, diagrams, drawings, etc.

V. I. Lenin felt that the compilation of tables, diagrams and drawings was highly important. In studying the various sources in the literature during the preparation of his study entitled "Imperialism as a Higher Stage in Capitalism", Vladimir Il'ich prepared a table in which the division of the world and changes in this division during the period from 1876 through 1914 were shown completely and graphically. Tables, diagrams and sketches are present in many of the other studies made by V. I. Lenin.

In his study entitled "One Step Forward, Two Steps Backward", in striving to give a full picture of the struggle within the Party at the Second Congress, Lenin decided to represent all the principal stages in voting at the Congress in the form of a diagram.

V. I. Lenin wrote, "This method probably would appear strange to a great many people, but I doubt whether it would be possible to find another method of presentation actually generalizing and summarizing the results that would be as complete and precise" [16].

The notes should be thorough. In no case should work be saved in making the notes, especially since they must be as creative as possible.

In the course of his work the researcher cannot always determine to what degree and in what volume the collected material may be used in his study. Sometimes that which today appears to be of little importance and uninteresting may later prove to be the most necessary material. Accordingly, even if all the material will not be later used in the study, it must be accumulated in the largest possible volume.

A source in literature must be studied to such an extent and such notes must be taken from it so that when the study is being written up in final form there will be no need for returning again to the book and so that it will be possible to rely exclusively on one's own notes.

It is not only necessary to take notes on what has been read, but also on one's own thoughts, critical comments, wishes, impressions, questions, etc., appearing during the reading. It is very important to learn to organize the material obtained from the reading in such a way that later it will at once be clear what was taken from the book and what represents one's own

thoughts. Accordingly, one's own hypotheses are written down with some distinguishing mark; for example, they are written in brackets, under a special symbol or mark or with one's own initials.

Notes in the form of quotations must be made with strict adherence to the author's text; in particular, it is necessary to retain the spelling, the punctuation, designation of paragraphs, etc. If in the quotation there are any words or groups of words which stand out by being in italics, heavy print, with spacing or if any other such method is used, these peculiarities in the text must be retained so that the quotation is precise. When the reader himself emphasizes individual words or parts of quotations he makes particular notes of this in parentheses after the quotation.

In order to distinguish the words of the author of the book or article from one's own ideas, each quotation is enclosed in quotation marks. The source from which the note was taken is indicated immediately thereafter in parentheses. For example:

"The best army and the people most devoted to the revolution will be quickly destroyed by the enemy if they are not adequately armed and supplied with food and trained" (V. I. Lenin, Soch. (Collected Works), Vol. 27, p. 54).

In making notes of quotations care must be taken that the author's thought is not distorted. This can happen when a quotation is taken from its general context. In order for this not to happen the following rule must be applied: make notes of quotations only after the entire text applying to the problem analyzed in the book has been read. In analyzing the author's words and quoting them, one must always take into account those historical conditions under which the author expressed a particular thought. Otherwise, the quotation can be interpreted incorrectly.

Sometimes when copying quotations there can be omission of some introductory statements, words or quotations marks without a loss for its meaning. In this case it is customary to replace the omitted text by three dots. The same procedure is used when copying quotations from the middle of an exposition; in this case the dots are placed after the initial quotation marks and before the quotation marks concluding the quotation. However, when citing a quotation in this form care must be taken that the author's thought is not

distorted in any way. It is better not to make any voluntary omissions and instead quote the full parts of the text, that is, sentences or statements.

If quotations, examples, figures and facts taken from other sources are encountered in studying a book, it is extremely important to check them exclusively on the basis of primary sources.

P. La Farge recalls: [illegible] always worked with the greatest conscientiousness; any fact, or any figure which he cited was confirmed by a reference to the most outstanding authorities. He was not satisfied with second-hand reports; he himself always went to the primary source, regardless of what difficulties were entailed, he even visited the British Museum when some secondary fact was involved so that he could check this fact in the museum library" [17].

Notes assume a great variety of forms. In some cases the content of a book is summarized, in other cases precise notes are made, whereas in still other cases only factual material and figures are taken, and finally, a brief comment on a book may be made. V. I. Lenin gave great importance to the synopsis as one of the most valuable forms of a note. He saw synopses as one of the means for a profound analysis of what had been read, a complete and thorough mastery of the investigated problem.

He wrote down everything which was interesting in notebooks. His notes were accompanied by comments, such as: "well said", "good example", "use", "very important", "good comparison", "return", "return again and again", etc.

N. K. Krupskaya describes Lenin's work on a book as follows:

"Lenin did not rely on his memory, although his memory was excellent. He never cited facts on the basis of recollection, "approximately", he set them forth with the greatest accuracy. He went through mountains of material (he read, as he wrote, exceedingly rapidly), but that which he wished to remember he noted down in his notebooks. A mass of notes was preserved in his notebooks" [18].

"If the book belonged to him he limited himself to underlining, to notes on the page margins, and on the jacket he noted only a page, underscoring it with one or two lines corresponding to the importance of the noted passages" [19].

Notes are written on individual cards or in working notebooks. In both cases one should write only on one side of the sheet or card. For convenience in systematizing material when making notes in a notebook it is sometimes desirable to set aside a definite number of pages in advance for some particular question or problem. When working with open materials, the cards will be more convenient for use. They are more advantageous than notebooks because they can be grouped and regrouped during the course of the work in any sequence in accordance with the requirements of a particular study. During the work they can be laid out in front of the researcher or taken to a lecture, to a report session, etc.

Uniformity in the placement of notes on a card is very important. For example, the source of the note is put in the left corner, the date in the right corner and the text of the note in the center.

Cards and notes are organized by topics and subtopics and kept in a card file or in envelopes. The general name of the topic or subtopic is written on the envelope or a special card placed in front of the set of other cards.

5. Work in Archives

Work in the archives is of the greatest importance for the military researcher. The archives enable him to select and accumulate various facts and statistical data. Having such data the researcher can successfully comprehend the tendencies in development of forms and methods of armed combat, analysis and revelation of the essence of the investigated phenomena. The study of archival materials makes it possible to detect such phenomena and facts which until then had not been reported in the military literature and which are little known or completely unknown.

The literature by no means always discusses all the sides of some particular phenomenon or fact. Archival documents afford the opportunity to fill this gap in relation to the problems investigated in this particular case. Moreover, it must be taken into account that in treating any particular problem in the literature different authors can approach it differently and in some cases particular problems are discussed in a biased way. For all these reasons the military researcher very frequently must have recourse to a detailed study of the archival sources.

In the Soviet Union there are tremendous archival resources in which hundreds of millions of documents are stored. The network of archives in the Soviet Union is very extensive and varied; it is organized on the basis of definite scientific principles, making it possible to store the very abundant documentary heritage of our country and arrange the national archives in such a way that without the loss of any significant amount of time it is possible to find the required documentary materials. The documents in the national archives are arranged by historical periods and taking into account the administrative territorial structure and the importance (scale) of the documents. Moreover, documentary materials are combined by individual branches of activity and topics.

With respect to historical epochs, the archival materials are divided into documents for the periods of feudalism, capitalism and socialism.

Depending on their importance, the documentary materials in the national archives of the USSR are distributed in the central, republic, kray, oblast, urban and rayone archives. Documentary materials are permanently stored in the central, republic, kray, and oblast and some urban national archives. Documents are stored for a definite period of time in all rayone and some urban archives, as well as in all departmental archives, and then shipped to archives with permanent storage of documentary materials.

The classification of archival documents on the basis of individual branches and topics is reflected primarily in the organization of national and departmental archives.

The military researcher has very great need for archival documents. Accordingly we will give a brief description of some of the archives where the military researcher can find the necessary materials.

1. Central State Archives of Ancient Documents [illegible];

2. Central State Historical Archives in Moscow (TsGIAM);

3. Central State Historical Archives in Leningrad (TsGIAL);

4. Central State Archives of the October Revolution and Socialistic Construction (TsGAOR);

5. Central State Archives of Motion Pictures, Photographs and Phonograph Documents (TsGAKFFD);

6. Central State Military History Archives (TsGVIA);

7. Central State Archives of the Navy (TsGAVMF);

8. Central State Archives of the Soviet Army (TsGASA);

9. Archives of the Ministry of Defense of the USSR and others.

The Central State Archives of Ancient Documents (TsGADA), with few exceptions, stores all the documentary materials of establishments and institutions of the Russian state beginning with the 16th century and running through the 18th century.

The Central State Historical Archives in Moscow (TsGIAM) contains documentary materials of the central and capital-city institutions of political security of Tsarist Russia and documents pertaining to state and political figures of the 19th and 20th centuries. The archives contain documents of the Third Division of the Tsar's Private Office, the Police Department, the staff of the Division of Corps of Gendarmes, the Moscow and Peterburg Security Divisions and provincial gendarme administrations, the Supreme Administrative Commission, the Main Prison Administration, the Shlissel'burgskaya Prison, Nerchinskaya and other hard-labor prisons. The archives contain many documents pertaining to the illegal revolutionary activity of V. I. Lenin, I. V. Stalin, K. Ye. Voroshilov, M. I. Kalinin, S. M. Kirov and other leaders of the Communist Party before 1917.

In addition to documents, the archives contain a large collection of illegal publications, among which there are many books, brochures, newspapers and proclamations published in Russia and abroad by Bolshevist organizations.

The Central State Historical Archives in Leningrad (TsGIAL) is the largest national archives in the USSR. It includes documents of the higher agencies of the government, national administration, courts and procurator's offices, the National Council, the National Duma, the Committee and Council of Ministers, Senate, Synod and ministries of: Justice, Internal Affairs, Finances, Trade and Industry, Railroads, Posts and Telegraphs, Agriculture and National Property, People's Education, the Tsar's Court, National Control, and others for the 19th and 20th centuries.

The Central State Archives of the October Revolution and Socialistic Construction (TsGAOR) contains documentary materials on the history of the

Great October Socialist Revolution, the history of the formation and development of the world's first socialistic state. These archives contain documents of the higher agencies of governmental authority, the agencies of national administration, the courts and procurator's offices of the USSR and the Russian Soviet Federative Socialist Republic: congresses of the Soviets, sessions of the Presidium of the Central Executive Committee USSR and the All-Union Central Executive Committee, Council of People's Commissars, the Supreme Council of National Economy, revolutionary tribunals, the Supreme Court and other governmental organizations of the USSR and the Russian Soviet Federative Socialist Republic, scientific research institutions and higher academic institutions. These same archives contain documents pertaining to the governmental agencies of the Interim Government and [illegible] counter-revolutionary "governments" existing during the Civil War and the foreign military intervention in the territory of the USSR. The archives also contain a very rich collection of printed materials (books, newspapers, magazines, proclamations, posters) from the time of the Great October Socialist Revolution, the Civil War and the foreign military intervention.

The Central State Military History Archives (TsGVIA) contains 4 million storage units; and has more than 15,000 files. The documentary materials in these archives pertain primarily to the condition of the armed forces in pre-revolutionary Russia and are the basic sources on military history. The archives contain documents from the Central Administrations and the organizations of the Russian army from the beginning of the 17th century to 1918. In addition, the archives contain documentary materials belonging to divisions, armies and combat units, as well as documentary files from fortresses. Documents pertaining to the history of the revolutionary movement in the army in the 19th and 20th centuries are of great interest. The materials from the office of the Minister of War contain valuable sources on the revolutionary movement in the armed forces during the period of the February Bourgeois-Democratic Revolution and the Great October Socialist Revolution. The battles of the Administration of Military Education Institutions, military academies and various military schools contain interesting materials on instruction in military art, education and training of the officer personnel of the Russian army.

The materials of the Main Military Sanitary Administration include documents on the history of development of military medicine.

During the last two decades the TsGVIA USSR has accumulated much experience in scientific work, publishing more than a thousand printed sheets of fundamental monographs, making it possible for large numbers of military historians to become acquainted with earlier unknown documents.

The Central State Archives of the Navy (TsGAVMF) contains all the documentary materials of institutions, naval units, naval groupings and fleets pertaining to the Navy Department and representing the history of the Navy of our Motherland.

The Central State Archives of the Soviet Army (TsGASA) contains a great number of documentary materials pertaining to the Armed Forces of the Soviet Union (in addition to the Navy), beginning with the Great October Socialist Revolution and running through the Great Fatherland War. It contains millions of documents on the Soviet Army. These documents graphically reflect the key role of the Communist Party, its Central Committee, headed by V. I. Lenin, in creating and strengthening the Red Army, in directing military operations on all fronts against the internal and external enemies of the workers. There are many documents describing the post war construction of the Red Army. The documents pertaining to the fronts, divisions and units tell of the feats and mass heroism of the workers and peasants, who rose to the appeal of the party for struggle against the interventionists and internal counter-revolution. The archives also contain materials describing the wartime activity of international units formed from Chinese, Korean, Czechoslovakian, Yugoslav, Hungarian, Polish, Finnish and German revolutionarily inclined comrades. The archives also contain documents pertaining to the legendary heroes of the Civil War.

The archives now contain virtually all the documents pertaining to the history and military activity of the Soviet Army during the period from 1918 through 1940.

The Archives of the Ministry of Defense USSR occupy a special place among the archives of the Soviet State. They contain documentary materials telling of the life and combat activity of the Soviet Army during the period of the Great Fatherland War and in part during the postwar period.

These archives contain eleven and one-half million items, thoroughly characterizing combat operations of our armed forces during the Great Fatherland War. [20]

These archives contain primarily documentary materials of all the main and central administrations of the Ministry of Defense, the different branches of the armed forces, the staffs of branches of the army and services of field administrations of fronts and armies; the staff of commands of all branches of the army; units, separate subdivisions and organizations at the rear. Moreover, the archives contain documents pertaining to the administrations of military districts, military academic institutions, courses, instruction centers and military departments at civilian institutions.

The documents of the Navy are stored at the Central State Archives of the Navy and in the archives of the Commander-in-Chief of the Naval Forces. The archives of the Ministry of Defense contain only those documents which have been received pertaining to commands and units of the land forces by way of exchange and information. This also applies to the documents of partisan detachments and the special units of the NKVD (People's Commissariat of Internal Affairs), which are stored in special archives. The documents of the units and divisions of the forces of the NVD (Ministry of Internal Affairs), transferred during the course of the Great Fatherland War to the Soviet Army, are stored in the archives of the Ministry of Defense.

The archives of the Ministry of Defense contain unique documents reflecting the bright stages of the heroic struggle of the Soviet people and its army for the freedom and independence of our Motherland against the German-Fascist invaders and the Japanese imperialists.

These documents are evidence of the progressive character of Soviet military science and its superiority over bourgeois military science. These documents tell of the heroism of Soviet soldiers, officers and generals, many units and divisions of the Soviet Army.

In the documents of the archives of the Ministry of Defense the researcher can find necessary facts and figures for the scientific analysis of many problems in Soviet military science and officers and generals of the Soviet army can extract from them experience on the education and training of Soviet troups.

All the documents in the archives of the Ministry of Defense are of scientific and practical value. By using them the researcher can write scientifically sound historical summaries, prepare many reference works of various types and write annotations to scientific studies. They can be used

in selecting material for a scientific communication, abstract, report, diploma work, dissertation, for an operational-strategic or operational-tactical outline, monograph, study aid, etc.

Preparation for work in the archives is an important stage in the researcher's work. The success of his work will be dependent to a large extent on how carefully his preparations are made and how clearly he visualizes the entire range of problems which he must research in the archives.

It is best to proceed to work in the archives after all the literature has been studied and a working plan for the research has been formulated which clearly defines the limits of the topic to [illegible]. [illegible] literature the researcher clarifies what data must be studied in the archives, the scope of the work which must be done, and therefore the length of time for work in the archives. After knowing the literature on his topic he will be able to check some facts and evaluations of individual phenomena and events made before him. Moreover, a study of the sources in the literature enables the researcher to make a more or less correct approach to the writing up of requests for permission to have access to the required archival materials and also clarify the regions where the military operations under study were situated and to select the required topographic map in advance.

Work experience has shown that during the writing up of requests, the researcher meets with great difficulties, particularly when studying operational-tactical problems.

Whereas in a study of an individual operation during the Great Fatherland War the researcher knows the time of its occurrence and the makeup of the armies participating in it, in a study of operational-tactical problems he must first determine where and when the events of concern to him actually transpired. As experience has shown, it is rather difficult to determine this. The researcher can obtain his first idea concerning such events by a study of the literature and conversations with participants in the battles.

After studying the sources in the literature and preparing a working plan it is necessary to become acquainted with the availability of documentary materials in the archives on the pertinent topic. This familiarization can be accomplished either by a personal visit of the researcher to the archives and an examination of the list of archival documents and inventories or by sending a written request to the address of the archives.

The request must indicate in detail the topic and purpose of the research, the name of originator of the file (field headquarters of the front or army, division or unit), structural and substructural parts of the archives (military council, staff, divisions of the staff, etc.), type and character of documents (planning, information reports, orders, plans, synopses, reports, journals of military operations, etc.) from which the particular event will be studied and investigated.

No request should be made whose answer would require special research, such as: "What materials are available on the attack of a rifle division for the purpose of breaking through a tactical zone of defense?" or "In what documents in the archives can one obtain data on the storming of major water barriers?", etc. The digging out of such materials is the task of the researcher, not the archives.

It is necessary to list the number or name of the higher command, division and unit (including both special and honorary), definite events and their dates or period of time, for example: "What materials are available on the attack of the 16th army in the attack operation on the Western Front in the Smolensk direction in August-September 1941?".

When it is possible to visit the archives for the purpose of digging out materials available and the proposed scientific theme it is necessary to take along a letter from the corresponding chief addressed to the chief of the archives in which the above-mentioned questions are written out.

After the availability of the appropriate materials in the archives has been determined, a request must be made out for access to the required documents. This application must give the following information: position, military title, first, middle and last name of researcher, topic, purpose and time of work in archives, what documents the researcher desires to use and for what period (it is necessary to indicate which documents are directly related to the theme and which documents can be used for an indirect confirmation of various conclusions).

When preparing an application for access to work in the archives it is necessary to take into account that the researcher will receive only those documents which are listed in the application. Accordingly, the application must always provide latitude so that the interrelationships of the investigated phenomenon can be correctly determined. For example, in the study of a battle

by any division it is necessary to make application not only for documents pertaining to the headquarters of this division, but also for documents of units falling under this headquarters and attached to it, as well as for documents of the headquarters of the corps or army under which the division operated during this period.

In making preparations for the work in the archives a thorough study must be made of the organization of enemy higher commands and units and enemy armament, as well as the organization of his forces during a particular period. This considerably facilitates the work in evaluating the enemy and determining the relationship of manpower and equipment.

In order to adhere to purposefulness in the collection of materials a plan for work in the archives must be drawn up; this should indicate:

-- for what sections (chapters) of the scientific treatise being written the archival work is necessary and what documentary materials (planning, information report, etc.) must be studied in the archives;

-- what appendices to the proposed work must be prepared on the basis of archival materials;

-- approximate times required for study of the documents (in days and during what period).

When departing for work in the archives it must be remembered that the archives do not provide researchers with topographic maps or working notebooks. Topographic maps (if they are secret) must be sent to the address of the archives and unclassified maps and working notebooks must be taken along. The latter must first be numbered and sewn and the military title, initials and last name of the researcher written on them.

In order to avoid the ruin of documentary materials notes in the archives can be made either in pencil or fountain pen. In the archives only pencils and inkwells for fountain pens are available; the researcher must have his own fountain pen.

The researcher must depart for the archives only after obtaining permission and at the time designated in this permission.

Upon arrival at the archives the researcher is obliged to familiarize himself with the rules for visitors to the reading rooms, obtain a temporary pass and present his working notebooks and topographic maps for registry.

The researcher's work in the archives begins after he receives his pass and selects the documents which he requires for his research. If the writing up of the application for access to the archival materials involves certain difficulties, the direct selection of the necessary documentary materials is an equally complex task.

The archives have such a great number of storage units that it is possible to find the required documents only if the researcher thoroughly knows the system of their storage, that is, the scientific reference techniques used in the archives. The scientific reference system in all archives is essentially the same. The only difference may be that in some archives the system has already been introduced, whereas in others it is only being formulated.

The scientific reference system of the archives is created in order to keep track of the documentary materials, furnish a guide to what is available and their arrangement and provide information on the content of documents.

The basic classification unit for all archives is the archival file. An archival file is a set of documentary materials formed during the course of the activity of an institution, organization or enterprise, or also individual persons. In the Military History Archives and in the Archives of the Ministry of Defense, as well as in all other departmental archives, files are established for documentary materials of each headquarters, higher command, division and military unit having a general army numerical designation, as well as for military institutions and military academic schools existing or having existed with the prerogatives of an individual unit. A file, as a historically formed complex of documentary materials, is not subject to division.

The archives have various kinds of scientific reference systems, each of which performs a definite role. However, the researcher will be primarily interested in guides on determining the content of the documentary materials. Such guides are usually in the form of inventories, catalogs, subject and file reviews, guide books and indices. In addition, scientific reference libraries are established for facilitating scientific reference work in the archives, for reducing to order the documentary materials and creating archival indexed manuals for them, as well as for facilitating the researcher's work in the archives.

Inventories are the basic documents in the scientific reference system, the researcher uses them for determining the entire complex of documentary materials directly relating to his topic and requests these documents for study. Inventories contain rather detailed headings for all the storage units in the file and in necessary cases they are explained by the compiler in the form of annotations.

In contrast to inventories, catalogs contain information simultaneously for several files or for the archives as a whole for an entire specific topic, such as: "Russian-Turkish War of 1877-1878", etc. Catalogs provide a thorough insight into the content of documentary materials on the investigated topic. They are chronological, systematic, specialized subject type, subject and author type.

Chronological catalogs provide an insight to the content of manuscripts and other documents available in the archives in a chronological sequence.

In systematic and specialized subject catalogs the content of the documentary materials is presented in a systematic sequence, that is, by degree of importance and correlation.

In subject and author catalogs the content of documentary materials is arranged in alphabetical sequence.

Reviews of documentary materials are descriptions of an information-reference character. Reviews give generalized descriptions of documentary materials in a file or groups of files applicable to the subject of the materials or applicable to the branch of activity of the organization forming the documentary materials. Reviews can be of subject or file types.

A subject review provides information on the content of documentary materials on a subject independently of whether the documents are found in one or more files.

File reviews provide information on the content of documents in only one file.

Guide books are prepared either for all the documentary materials in the archives or for a group of related files. A guidebook is a systematic index of files with a concise description of the character and content of their materials. The guidebook indicates the availability of the entire scientific

reference system in application to definite topics and files. The guidebook also gives information and a brief description of the organizations which formed the materials in the files. It is best to begin familiarization with archival documents with a guidebook because it, in addition to a general description of the documentary materials, also contains information on books, monographs and articles which were written after recourse to archival documents.

Indices usually const te a list of subject titles. They are prepared for all kinds of archival references and are intended for orientation of researchers in the scientific reference system of the archives.

A scientific reference library is established in all state and departmental archives. It includes all reference works and descriptions, ... pedic dictionaries and other descriptive works which enable the researcher to find the necessary reference data without delay. The scientific reference library of the Archives of the Ministry of Defense contains collections of documents and military history materials on the Great Fatherland War. Moreover, this library also has other reference books and reviews of documents on the operations of the Great Fatherland War and collections of sheets of topograhic maps of regions where military operations took place.

It should be noted that the described organization of the scientific reference system is characteristic for the most part for all archives. Only a few departmental archives are presently exceptions to these rules.

These archives are also taking measures so that the above-mentioned scientific reference system will exist, but much work still must be done to bring this about. In the next few years the appearance of guidebooks for these archives can also be expected. With respect to reviews and catalogs, it must be assumed that they will appear considerably later.

The documentary materials in such archives at present must be selected from available inventories which do not always satisfy the requirements which are imposed on them. In some inventories items are included for some years without indication of dates in the titles in the inventories. For example, the heading in an inventory may indicate that items for 1942 were entered, whereas in actuality items for 1941 and 1943 are also present. The names of items entered in the inventories sometimes completely fail to suggest the content of the documents contained in the files. All this creates great difficulties for the researcher.

In undertaking work in the Archives of the Ministry of Defense, where no scientific reference system yet exists, it is desirable that the researcher first consult in the scientific research section of the archives and carefully study the systematic manuals available in the archives, among which an aid entitled "Problems in the Method for Work by Researchers with Documents in the Archives of the Ministry of Defense of the USSR" is of particularly great value.

Work in the Archives of the Ministry of Defense must begin with a study of the inventories of documentary materials for the purpose of determining the necessary documents, deciding on their significance and sequence for study. The study of the inventories must at the same time be accompanied by the preparation of applications for the selection and access to documents. Study of the inventories is a very important stage in the researcher's work in the archives, particularly considering the current status of the inventories, when the archives in many files have only rough inventories containing many inadequacies, with inaccuracies in the names of the storage units, with non-correspondence of the title to the actual content of the documents in the storage units.

In studying the inventories it is necessary to examine all the inventories of the files to which the officer researcher is admitted. All the storage units which merit attention must be listed on the application blank. A separate application must be prepared for the documents in each file.

The first application must be prepared as quickly as possible and handed in to the director of the reading hall so that it will be used in initiating the collection of materials while the researcher himself continues to dig out the documents required for study. If any confusion arises during the study of the inventories of documentary materials this must be straightened out by consulting the director of the reading hall or consulting the corresponding head of the archival records and the section head or his deputy.

Sometimes some documents required for the research cannot be found in the inventories of documentary materials of those structural units to which the researcher is admitted. In this case it is necessary to run through the inventories of other structural units of the particular file, such as that for the Secretariat of the Military Council, the Political Section, etc., the

inventories of the corresponding structural units of higher echelons and even subordinate units to which the documents might have been sent.

When the documents required by the researcher are discovered in other files he must consult the director of the archives or his deputy for scientific work and receive permission to use these documents.

6. Method of Work With Archival Materials

In each specific case the method for working with archival materials can be different. In every case it will be determined by the researched topic, the purpose in using the archival materials and the nature and content of the latter. Accordingly, in our monograph we can discuss only the most general problems involved in the method for working with archival documents in a study of battles and operations.

In proceeding to work on archival document it is first necessary to evaluate it thoroughly. The value of each document must not be determined without consideration for other documents; all must be considered together.

Now we will examine the basic criteria which must guide the researcher when evaluating archival documents.

First, the content of the document: does this document correspond in its content to the research topic, what relationship does it have to it, direct or indirect? Preference is given to a document which corresponds directly to some one of the problems formulated by the researcher.

Second, the date of origin of the document. Here it is necessary to take into account the circumstance that a document can originate after the investigated event took place, but despite this, it fully reflects the particular phenomenon. For example, a report on the combat operations of a unit or higher command originates after the combat operations themselves, but the informative value of this document, as is well known, is very great.

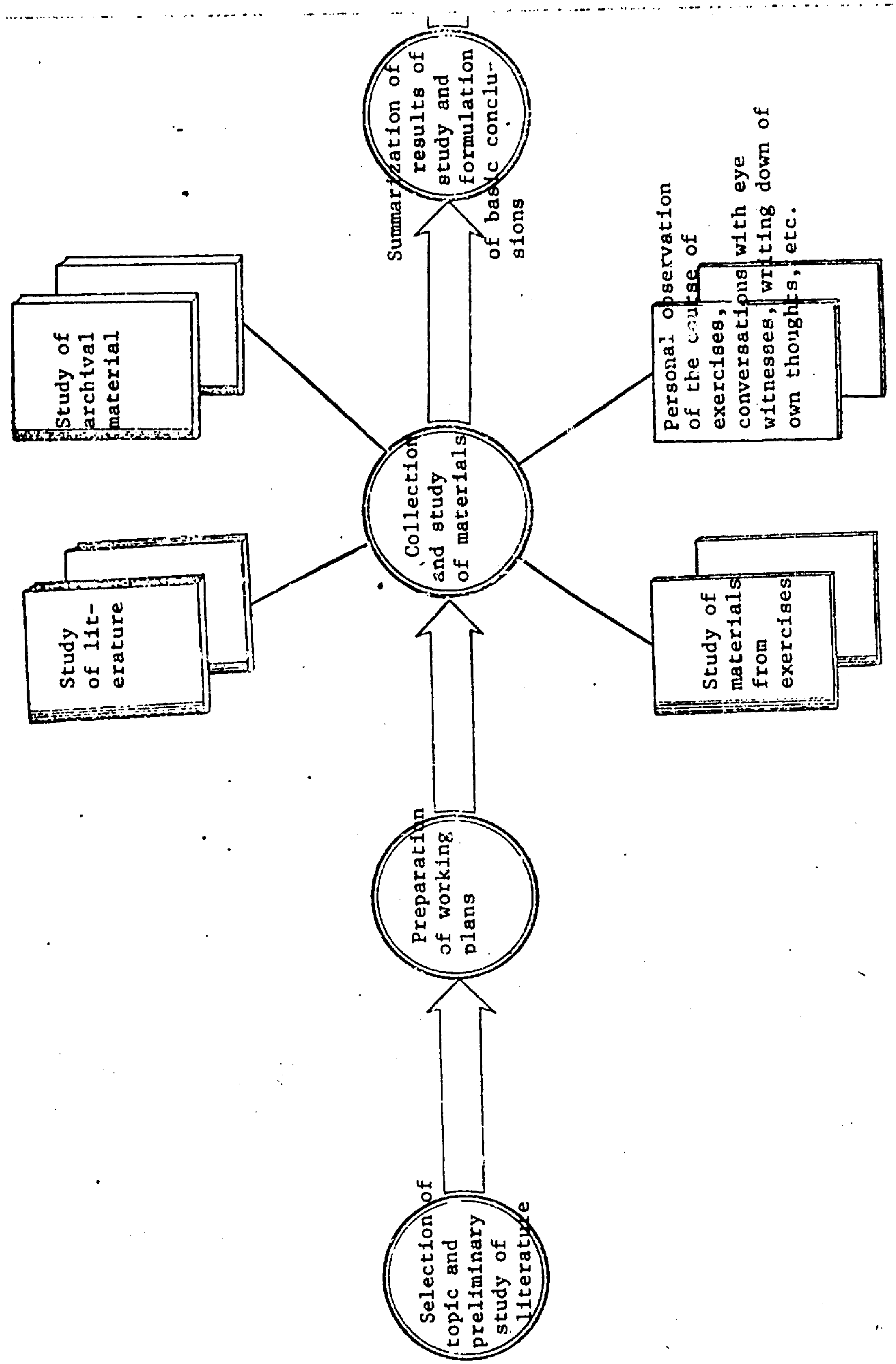
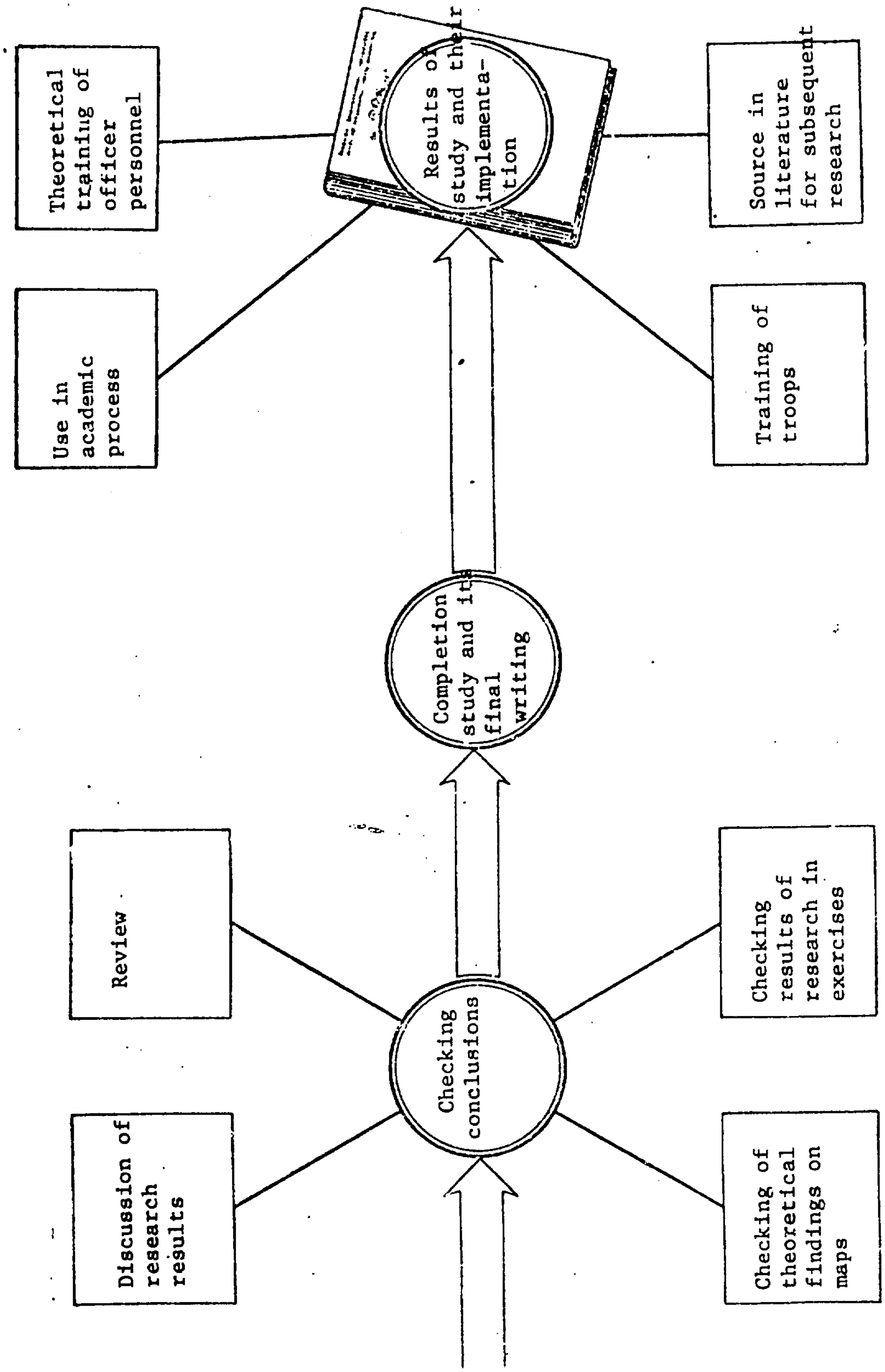


Diagram. Block Diagram of Process of Scientific Research on Problems in Military Theory.



(Continuation of Diagram)

Third, the author of the document: was the document written directly by a participant in the event or was it compiled on the basis of reports, witness of participants, etc. For example, a document written by a regimental commander on the military operations of his regiment, even if this document has a low quality of execution, is of greater interest for the researcher than a well written staff document from the division or corps on this same event. Vice versa, a division commander more correctly reports the combat operations of the entire division than any of the unit commanders or other responsible individuals subordinate to him not associated, due to the nature of their division, with all aspects of the combat activity of the division.

In evaluating the author, the researcher is obligated to give heed to whether the document was written personally by the author or was entrusted to some other individual, official though he might be. In the first case the document is of greater value and has greater juridical validity.

In many cases the researcher cannot find signatures or the official designation of responsible individuals in the document, particularly their carbon copies. In such cases attention must be given to brief instructions or notes written by official persons on the margins of the document. If these notes make it possible to determine that the document was put into force, the researcher can use it.

In discussing copies, it must be noted that the original, signed by the author (commander or chief), is better. The researcher must strive to locate and study it.

Fourth, the origin of the document: under what conditions was the document prepared? Was it in the heat of battle, or later, in the headquarters or at the very front, hastily or over a long period of time? Each participant in war knows that sometimes documents are prepared under the most difficult circumstances: during continuous bombardment by the enemy, during rain and snow, frequently in pencil, on wrinkled low-quality paper, while walking, on horseback or on the march, with dim illumination of a flashlight or by a lit match. The value and reliability is also determined by the conditions of its origin.

Fifth, how completely does the particular document reflect the investigated event? The best document is one which most completely and thoroughly covers the investigated event.

Sixth, the researcher can meet with a situation when the same phenomenon is covered by a number of documents, the content of some overlapping or incorporating the contents of others. The researcher must also take into account the degree of consolidation and use as his basic source the document which summarizes the content of others and he should take from the latter only that material which is not reflected in the document used as the basic source.

Finally, a document's literary and graphic qualities and its physical condition play more than an insignificant role in the evaluation of documents. Well-finalized documents, written literately, in simple and clear language and on good paper are more easily used in scientific work and it is no accident that they are used by researchers to a greater degree and with greater willingness than other types of documents.

Documents must be studied with a critical eye, in every case taking into account the degree of their reliability. The most reliable sources are official documents, but as experience has shown, these require a mandatory check. Reports frequently are written with a biased point of view, particularly when they come from an excessively vain commander. He strives to hide and somewhat color the failures of the troops under his command and excessively exaggerate and praise their victories, thereby heaping praise on himself. Accordingly, for determining the truth it is desirable that such reports be compared with reports prepared by higher and lower echelons and make extensive use of reports prepared by headquarters officers and those who can be trusted as the most unbiased.

Archival documents can be subdivided into primary and secondary on the basis of the nature of their execution during the course of military operations and their significance.

Primary sources include orders, commands and instructions, planning tables of coordination, combat reports, operational and reconnaissance reports, etc., that is, all the documents on the basis of which the control of troops in combat is accomplished.

Secondary documents are those prepared on the basis of primary documents after the battle (operation) has already taken place: journals of combat operations, reports on completed battles and operations, synopses of generalized combat experience, report maps and other documents.

In studying the primary sources it is essential to determine what document exerted an influence on the organization and course of combat.

In the archives it is common to find literately and well-finalized orders, but these orders were prepared with a considerable time lag and did not reach the troups in time or were delivered after combat operations had already terminated. It is entirely clear that such a document, however well it was written up, cannot have exerted any effect on the combat operations of the troops. Accordingly, in studying documents serious attention must be given to the time of their receipt, to instructions and notes on their margins, and careful attention must be given to the transcripts and records of telephone conversations in which there was discussion of a particular document.

In order to make productive use of the time allocated for work in the archives, the researcher, in undertaking work with archival documents, must lay out a definite work plan and study the documents in a strict sequence.

The study of archival documents in a study of a battle (operation) of a higher command (headquarters) should preferably begin with a familiarization with the documents pertaining to the superior headquarters. This makes possible a correct determination of the role and place in the operation played by some division or higher unit whose military operations are being studied.

After becoming familiar with the documents pertaining to the superior echelon, it is desirable to give particular attention to the journal of combat operations in order to obtain at once at least a superficial idea concerning the principal circumstances, time and nature of development of the combat operations with the most complete coverage of the entire event. This familiarization at the same time makes it possible to establish the limits within which it is necessary to study the investigated phenomenon.

After familiarization with the journal of combat operations it is very useful to make a more detailed study of the conducted operation, etc. The study of such documents makes it possible to visualize the event as a whole and establish the place and role in the conducted operation played by the units whose combat operations are of interest.

In the study of reports and summaries of generalized experience it is impossible to accept everything on faith and it is particularly harmful to

agree blindly with the conclusions which are drawn in them. It must be remembered that in writing such reports the compiler may have manifested a certain bias caused by the desire to exaggerate the role played by his unit in the conducted operation. In such cases not only the conclusions, but the facts as well can be presented in such a way that the successful military operations can completely overshadow all kinds of failures occurring in the course of the operation. Such negative events have very great importance for the study because without them it is impossible to reconstruct correctly the entire picture of the investigated event.

Accordingly, after studying generalizing documents it is necessary to make a thorough study of the principal planning and report documents which would provide the researcher with a full idea of what was planned and how the operation actually transpired, as well as what successes were attained as a result of its occurrence. Study of all these documents will enable the researcher to understand correctly the general and special circumstances under which the operation took place and clearly visualize the role and the place of the unit whose combat operations are being investigated.

It is scarcely desirable to note all the data concerning the general situation in a working notebook. It is better that all this be plotted on a map. This undoubtedly will save time, but the most important consideration is that in this way a more profound understanding of the overall situation will be obtained.

After obtaining some idea concerning the overall situation, the researcher proceeds to a thorough study of the documents pertaining to the unit. However, in studying these documents it is also important to adhere to a definite sequence in the work.

At first it is desirable to study the combat experience of the unit, but not only during the time of the battle (operation), but for a considerably longer time. This will enable the researcher to visualize what combat actions the unit was engaged in previously and what combat experience its personnel had. A knowledge of combat history of the unit makes possible a proper determination of the extent of its combat capability and determine all the characteristics of this complex combat organization. Later this will be of great assistance in analyzing specific combat or operational events.

After becoming familiar with the descriptions concisely describing the combat experience of the unit, it is desirable to study the above-mentioned generalizing documents in greater detail, with the registry of all facts and their analysis. After a detailed study of these documents the researcher must form a firm idea concerning the battle or operation and those conclusions which were drawn at that time by the commanders. If in the course of the study the researcher has some doubts as to the correctness and accuracy of individual conclusions or descriptions of some facts he must make a note of this in his record book or working notebook in order to check this during the study of other documents.

After working with the generalizing material the researcher proceeds to study combat and report documents applying to a particular battle or operation. Such documents usually will be orders, directives, instructions, plans, reports, operational synopses, etc. Study of all these documents will enable the researcher to study thoroughly all aspects of the battle or operation. At this stage in the work the researcher must examine with special care all the working and report maps, as well as reports prepared by lower echelons in order to not accept as real events those which were planned but which in reality never took place. At this time the researcher must study documents not only for the unit which he is investigating, but also documents for the higher and lower echelons which will be included in the same archival file. After studying the documents for the investigated unit, one must immediately proceed to a study of documents of subordinate and interacting units because otherwise it is impossible to visualize the investigated event in its entirety and with complete detail.

The study of documents must be done in sequence, in the order of their arrangement in the storage units, but there can be deviations, especially in a case when the documents in the storage unit have not been arranged in a strictly proper sequence reflecting the logical development of events.

In addition to a definite sequence of study of documents, it is very important to make the notes properly because the result of unsystematic notetaking is that individual facts will be written down several times whereas others will not be written down at all.

The system of taking notes is determined by the topic and purpose of research.

In studies of operational-tactical problems, when several battles are being studied, notes can be taken (depending upon the formulated objectives) for each battle and operation in individual notebooks or in one common notebook. However, in either case a very definite place must be set aside for each problem being investigated. For taking notes it is better to select a notebook with thick paper; notes are made on only one side of the page, leaving broad margins (up to one-third the width of the sheet). These margins will be necessary for noting down data from the scientific reference system. After taking notes completing the description of some fact, it is desirable to leave space in the notebook so that in case of necessity it will be possible to enter necessary corrections and insertions or make new notes from archival materials of other files which can reveal new aspects of a particular fact or will contradict earlier notes.

Notes must be taken scrupulously, not permitting arbitrary abbreviations, since this frequently means that upon completing the entire work the researcher will be unable to read much of that which he has written down.

In the margins opposite the notes or records of data from documents, the researcher must indicate the name of the document to which it relates, the time it was prepared and the place where it can be found in the archives (number of file, inventory, storage unit and pages). This information will later make possible a judgment concerning the character of the document, particularly when comparing contradictory data obtained from different sources and will also assist in rapid location of the document if there is again need to consult it.

When copying data from coated documents one should make reference to the method by which these documents were transmitted, as well as their beginning and concluding numbers.

The degree of detail of the notes can vary greatly. It is determined by the availability of necessary data in the studied documents and the experience of the researcher. An experienced author usually writes down only a limited amount, but his concise notes contain everything necessary for characterizing a battle or operation. In the case of an inexperienced researcher, his notes at first are very lengthy, burdened by secondary details which are of no value for the researcher.

In order to shorten the notes as much as possible and at the same time omit nothing which is of great importance for the researcher, it is recommended that all data on the situation be plotted on a map; it is desirable that a map be kept at hand during the course of the entire work in order to most fully and graphically visualize the investigated battle or operation. The availability of a well marked map for each battle (operation) makes it possible to reduce note taking and aids in a more thorough study of the investigated event. A map affords the possibility for evaluating the influence of terrain on the nature of development of the battle (operation) and aids in comprehending the content of textual documents.

When working with a very large number of documents, when many battles are being studied or when the objective of the study is the collection of definite statistical data, extensive use can be made of tables and forms which are prepared in advance and are filled with the necessary data during the course of study of the documents. However, it must be remembered that the tables and forms also have their negative aspect. They isolate the researcher in a way from those data which do not fit into the columns of his tables and forms. In order to avoid this it is necessary that the tables and forms have a space for entry of secondary data which are of great importance for clarifying the nature of the investigated event.

If the tables have gaps they must be filled by studying other documents. An effort must always be made to see that all columns in the tables and spaces in the forms are filled.

In writing studies in military history, which discuss only a single operation, the system of notetaking, as shown by experience of work in the archives, can be somewhat different. The fact is that the structure of such studies in the overwhelming majority of cases is standard. The classical outline for such monographs usually includes four chapters: the first describes the general conditions, the second discusses preparations for the operation, the third covers the course of combat operations and the fourth gives the summary and conclusions. Moreover, in such studies the divisions of the chapters are also usually identical. All this indicates that the scientific worker who desires to write a monograph upon arriving at the archives can already have a well-developed plan for his future work.

Accordingly, it is desirable that he take his notes in accordance with the plan for writing the study. For each chapter (section and subsection) it is necessary to allocate the necessary number of pages in the working notebook or an entire working notebook. The title with an indication of the numbers of the pages allocated for chapters, sections and subsections of the topic must be written on the first page of the notebook.

Making notes by sections and subsections of the topic ensures a systematic arrangement of the materials even during the course of their study in the archives and also makes it possible to judge the completeness of the selected material for the particular section or chapter. Making notes in this way precludes the possibility of taking repeated notes on the same material, but from different sources. Moreover, in working on a monograph in military history, devoted to a description of some operation, this system of notetaking sometimes makes it possible to write up the notes in these same notebooks without expending time on a transcription of the material into other notebooks.

It is desirable that separate notebooks be used for tables, diagrams and copies of military and information documents. Before making a copy one must determine whether this document has been published in other scientific works.

If archival storage units are encountered during the course of the work from which there is no need to make notes in the working notebooks, this should be indicated on a separate page of the notebook, simply making a note as to their lack of information. This frees the researcher from the need for a repeated examination of the same documents if they are found in other files in the archives.

The study of documents and the selection of appropriate material from them do not constitute a simple job of seeking out important documents and copying them, as is done by some researchers, but instead is a creative process. For example, it is completely inadequate to write down that such and such a unit, as a result of an attack, reached a certain objective; it must be indicated to what distance from the starting point the unit advanced, in what zone, with what rate and in what combat grouping this attack was made, at what distance from the original line and for what purpose secondary echelons and reserve units and the main body itself were used, etc.

Some researchers feel that all the work on study of documents can be done after the documents have been collected and "copied", that is, after completing work in the archives. However, this is very risky.

The experience in work in the archives shows that some poorly prepared researchers, in studying archival documents, copy into the working notebooks everything that is found in the storage unit. They strive to copy down as much material as is possible in their working notebooks. They leave the archives with a feeling of satisfaction after filling up a large number of working notebooks. However, as soon as they begin a more thorough analysis of the notes brought from the archives they experience disenchantment and they find themselves in a difficult position. A great deal of time has been spent, a pile of notes is at hand, but these notes fail to answer many questions. In some cases there are no basic data for analyzing all aspects of various facts and some phenomena which seemed more or less clear while in the archives no longer can be recalled. The researcher inevitably is faced with the need for a return to the archives.

For a profound study of the content and essence of battles and operations, among all the documents it is most important to select factual material from which it will be possible to determine the reliability of facts and events, the most characteristic features of the pertinent battles and operations, and reveal everything which was new which transpired in the course of these events.

In order to determine the interrelationship and intercausality of the investigated battles and operations it is essential to study the materials for higher and lower echelons and neighboring units.

Data (textual and graphic) on the operations of combined groups, divisions and lesser units must be used for one level above and two levels below; this must be taken into account when writing up applications for admission to the files. Data on the operations of other arms of the service must be collected as fully as possible in order that their operations can be thoroughly investigated.

In studying the factual material in the archival files the researcher frequently cannot find those data or documents which are extremely necessary for his analysis. In this case it is desirable to consult indirect sources, such as reports or messages of the service chiefs to higher echelons. Such

documents, in addition to an exposition of the problems relating to their service, usually discuss other matters which can be of interest to the researcher. Moreover, many phenomena in battles and operations can be reconstructed from individual combat orders, instructions, secondary orders and reports which were available at subordinate headquarters and the headquarters of neighboring units.

With respect to individual matters, information can be obtained from memoranda, reports to a commander prepared by the commanding officers of different arms and chiefs of different services.

In very many cases it is necessary to have a recourse to indirect documents for determining the combat and numerical makeup of units and groupings of units prior to the onset of combat. The fact is that reports on the combat and numerical makeup of forces are prepared routinely on the first, tenth and twentieth of each month and combat operations can also begin on other days. Moreover, prior to combat it is common to supplement the manpower and bring the armament and equipment up to full strength. All this can greatly change the manpower situation of the unit or group within a very short period of time. In order to determine the true number of troops in each individual case, it is necessary to make a careful analysis of the data of gains and losses from the day of preparation of the last report on combat and numerical strength. The gain and loss of manpower, as well as losses of armament and military equipment, are usually reflected in personnel orders, operational memoranda and reports of commanding officers of the various arms and service chiefs. In the absence of reports on combat and numerical makeup this information can sometimes be found in coded telegrams sent from the command.

During the course of work on archival materials very interesting factual data can be found; after reflecting on these data the researcher may have original ideas and individual proposals on his topic, as well as on matters unrelated to the selected theme. Such thoughts must certainly be written down in a special notebook set aside for this purpose. It is necessary to note down not only ideas applying to one's topic, but also individual thoughts on other subjects which sometime may be of value. This will be of great assistance to the researcher in studying and writing up his work.

During the course of all one's work in the archives it is very useful to keep a working diary in which it is necessary to note everything of interest

found in the archives. If this is not done at a later date there will frequently be cause to regret it.

7. Use of Combat Experience of Past Wars in Making a Study in Military Science

The methods and procedures for investigating battles and operations, as shown by experience, can vary greatly. They are determined by the selected topic and purpose of the research, the degree of work which has been done on the topic, the availability of archival sources and their content, and finally the individual peculiarities of the researcher himself.

The most typical procedures for investigating the experience of battles and operations are: writing monographs on each battle (operation) separately for the purpose of a thorough study of the military event and formulation and new principles of military theory; use of examples from military history for analysis of individual typical battles and operations, such as the width of the attack front, the depth of combat missions, etc.; the use of examples from military history for the purpose of determining the most characteristic aspects in combat operations of troops which can be used for clarifying and in individual cases for confirming individual principles in the theory.

The writing of monographs makes possible the most thorough study of the experience of a battle (operation). A researcher can extract lessons useful for his purpose only in the event that he is able to reconstruct the investigated event with such detail that nothing remains puzzling to him.

If an officer has been assigned the task, for example, to study the combat of a division which is encircled on the basis of wartime experience, he selects the greatest possible number of appropriate combat examples. He must study all of them in great detail. Otherwise, he cannot draw any general conclusions concerning this type of combat. However, for a study of each combat example the combat must be described and all its details recreated, that is, a monograph must be written and conclusions drawn. Then, on the basis of many facts, one can find what is typical in the operations of forces and draw general theoretical conclusions. The latter for a particular type of combat can contain conclusions concerning the conditions under which encirclement occurred, on the admissible and desirable extent of the defense front, on the methods and techniques of combat during encirclement and for escape from encirclement, etc.

In examining the documents on battles and operations in the archives the researcher never finds in them any data in the form in which he would like to obtain it. There is an abundance of data, but they are available in a multitude of sources. No full picture of the battle (operation) is formed from a study of each such source separately. Moreover, those documents on the basis of which the battle was planned and waged rarely describe it fully because in addition to the documents prepared by the headquarters, in each battle (operation) a major role is played by oral instructions and orders from the commander; these by no means can always be found in the form of written records in the archives.

In order to reconstruct a battle (operation) with all its details it is necessary to prepare a monograph for each battle (operation); this monograph, together with a detailed description of the organization, preparations and course of combat operations, must give sound conclusions.

The writing of such monographs requires the preparation of a plan, that is, a determination of those matters which must be raised in describing the example and the sequence of their discussion so that on this basis it will be possible to draw valid conclusions.

Very frequently, upon arriving in the archives, especially when investigating highly mobile forms of combat, such as pursuit, hasty breakthrough of an occupied defense, combat during encirclement, escape from encirclement, etc., the researcher, hastily becoming familiar with the documents, quickly concludes that there is almost no material available on his topic. However, as experience has shown, this is by no means the case. Materials are available in the archives on all types of combat and all its different forms. However, for one type of combat they are readily available in graphic, but for other types there is very little material and at first glance they do not appear of interest. However, this is an extremely erroneous conclusion. It is difficult to study highly mobile forms of combat, but it is not impossible. It is only necessary to proceed with intense and careful work and probably a valid and thorough monograph will be produced.

The writing of a monograph must begin with the preparation of a topographic map for the region in which the battle (operation) transpired. Then it is desirable to proceed to a study of the documents for the higher headquarters and everything which pertains to the investigated problem is then plotted on

a map. This makes possible a proper orientation in the overall picture, that is, trace how the combat events developed during the operation and what role the operations of the investigated units (grouping) played in it. Then it is necessary to study all the documents for the considered period and also plot the data extracted from these documents on a map. At the same time it is necessary to analyze carefully the documents for lower echelons, with the mandatory plotting of the entire course of their combat operations on the map.

As a result of such study the researcher gradually forms a full picture of the appearance, preparations for and development of the investigated type of combat or operation. It goes without saying that contradictory data will be encountered in the course of such work. For example, by orders of a higher echelon the grouping (or unit) must execute certain military operations using the instructed method, but for a number of reasons, very frequently beyond its power, it acted completely differently. By comparing the data for the investigated unit (grouping), the higher and lower echelons, as well as neighboring units and a detailed plotting of the entire course of the battle on map the researcher can recreate a relatively complete and graphic picture of the events which occurred.

After studying the documents and taking from them all the required data, and in those cases when no data are available on certain matters, extracting them from indirect sources, the researcher proceeds to a detailed description of the combat example, guided by the map and the notes which he has made. After writing such a description, the researcher strengthens, develops and deepens his knowledge concerning the events and phenomena which he has studied. A fact described on paper is clearly implanted in the memory and the logical development of events is recreated; this affords the possibility for drawing sound conclusions.

It is desirable that the conclusions be drawn in the order of the logical development of events. First it is necessary to draw conclusions concerning the conditions under which the battle developed, that is, determine what influence was exerted by specific combat conditions on the occurrence of a particular battle. Then conclusions must be drawn on the organization and preparations for the combat, determine how carefully the battle was organized, what positive and negative aspects there were, what innovations existed, that is, what was done or what happened which has not been yet covered in the

literature on military theory and history and is not covered by regulations and instructions. Then detailed conclusions are drawn on the course of combat operations. Our operations must be compared with the operations of the enemy and it must be clarified to what extent the operations of the enemy exerted an effect on the operations of our forces and what character the battle could have assumed if one of the sides had employed different combat methods.

In formulating the conclusions, particularly on the course of combat operations, the researcher must use the map which he has marked up rather than rely primarily on the description. The map with the plotted conditions ensures that a thorough analysis will be made and it affords the opportunity for trying profound conclusions. However, this is possible only if the researcher will regard the map as a chess player looks at the chess board when the opponent is making his move, rather than regarding the map as a photograph.

In making sound conclusions for the considered example, the researcher is assisted by having very valuable knowledge enabling him to make a thorough analysis in theoretical problems. Many aspects of the phenomenon become clear and some matters which at first glance appeared to be secondary can prove to be very important.

Such monographs must be written for several examples: the greater the number, the better. This makes it possible to select from their number the examples which are most typical and instructive. The examples must be of the same scale and insofar as possible from different periods during a war.

When the researcher, as a result of careful work in the archives, has prepared several such monographs in accordance with a definite scheme and after having drawn sound conclusions, he can proceed to a generalization, a comparison and an analysis of the conclusions drawn in each individual monograph. On this basis he can formulate general conclusions. In the formulation of general conclusions the researcher determines what was an innovation in the course of the development of the combat operations, what methods, techniques or equipment began to appear obsolescent, what facts had a purely random nature and scarcely would be of value for the future.

The sum of the conclusions from a number of monographs enables the author to draw rich theoretical generalizations which he could never extract from the literature or from official manuals.

The use of examples in military history for analysis of individual battles and operations can find application regardless of whether or not monographs are prepared. This method for the use of the experience of past wars is used most extensively in the study of restricted topics, that is, when the topic does not cover a battle as a whole, but only one of its aspects, such as determining the width of an attack front, the depth of combat missions, etc. In this case the researcher selects only the data which concern him and arranges them, usually in tables. When using this method one must always remember that in no case must the selection be done mechanically. For each example from which the researcher extracts necessary facts he must clearly visualize why such events took place and what caused them under the specific combat conditions.

On the basis of such work thorough differential tables must be prepared with columns showing not only the data of interest to the researcher, but also to some degree characterizing the objective conditions of operations by the combat units.

It is also mandatory to use this research method when studying a battle or operation as a whole. In this case the researcher formulates in advance the problems which must be studied by this method. In this case he uses combat examples on the basis of which he writes monographs; however, he also uses examples for which monographs are not written. In addition, this method is extensively used in formulating general conclusions from a number of monographs.

The researcher must mandatorily draw sound conclusions from each table.

The use of examples from military history for the purpose of clarifying, and sometimes even for confirming individual principles in theory is used very extensively. For clarification purposes it is best to cite a concise example, the fundamental essence of which is not clouded by details. If a particular fact is well-known to the readers, it can simply be mentioned without describing the fact itself. Some authors, particularly young ones, frequently cite examples for demonstrating their theoretical principles completely forgetting that this method, used in isolation, can prove nothing. "An example is no proof", wrote V. I. Lenin [21].

The fact is that wartime phenomena are extremely varied. As a result, one can find confirmation of any principle, even the most absurd. Accordingly, this method must be used within the bounds of reason. For example, in discussing the inflicting of concentric blows at the base of a wedge for the purpose of surrounding an enemy grouping, one can cite the experience of encirclement of the German-Fascist armies at Stalingrad. However, in this case the example proves nothing but only explains, that is, creates better understanding.

Combat examples can be used as a confirmation by citing analogies with formulated theory. For example, a researcher after making a thorough analysis concluded that the command of forces left for cover and organized into screening forces must be centralized in the hands of the deputy commander; as an additional confirmation of this, for example, he might cite two examples. In one of them everything indicates that only a strictly centralized and firm command could ensure the overcoming of tremendous difficulties and the mission was successfully accomplished. However, in the other example, where the conditions were considerably easier, there was a complete catastrophe simply because in the field there was no one to coordinate the operations of several subunits, organize and inspire them to execute their combat mission. It is entirely obvious that such use of combat examples can be regarded as successful because the theory is not derived from these examples but they very clearly and convincingly confirm the validity of this theory.

When writing studies in military history in which a single operation is investigated, the same method is used as when writing monographs. However, in this case the researcher can also undertake visits to the area in which operations were conducted. This enables him to recreate in the field the entire picture of the investigated event.

When studying individual operations a thorough account of the operations of the enemy, as well as our own forces, is of very great importance, taking into account their interrelationship. As is well known, war is an active two-sided process. The operations of the combatting sides in many respects control one another. However, in some investigations in the field of military history the study of the operations of the enemy is limited primarily to collection of material for writing special sections on the status and grouping of the enemy during preparations for the operation. However, in the study of

the course of military operations the opposite side in many cases is transformed into some kind of abstract background, into an undefined "enemy" which only "plays" our side and does not always take on specific features. It is necessary to be quite objective in investigating the military art of the enemy, set forth the intentions and decisions of its commanders and the operations of its forces, analyze the reasons for successes and failures, etc. This requires a thorough study not only of our documents concerning the enemy, but also the study of his own original documents, naturally if such are available.

It is also necessary to discuss the study of operations by different arms of the service, the use of combat weapons and the determination of the relation of forces. Modern combat and operations involve the use of combined forces. Accordingly, in a study in military history there must be a thorough analysis of the operation of different types of armed forces, different arms and special forces, as well as different combat means, taking into account the terrain, season and meteorological conditions.

When determining the relation of forces of the different sides one must take into account, particularly in a study of attack operations, that our forces during preparations for attack were not always able to obtain complete and exhaustive data concerning the enemy. The Fascist command devoted much attention to secrecy in the disposition of their forces, took measures for careful camouflage, created dummy structures, etc. For this reason the complete picture of defense and grouping of the enemy became apparent only during the course of combat operations. Therefore, when determing the relation of forces one must take into account all the enemy forces which actually participated in the operation, not merely those which were present within the tactical zone prior to the onset of attack by our forces. Moreover, in reckoning the relation of forces it is desirable to take into account the entire attack front and then determine the relation of forces by directions, in the breakthrough sector. This will characterize the actual picture of the combat and show the ability of Soviet commanders to concentrate forces correctly and at the proper time in the most important directions.

In evaluating any past event, the military researcher must always bear in mind that this evaluation must be made on the basis of knowledge and information which the military commander had at the time when the event itself took place, not on the basis of what became known to the researcher at a later date.

One of the major shortcomings of some historical studies is a tendency (voluntary or involuntary) to evaluate events and decisions which were taken at some time from the point of view of present-day possibilities. Another shortcoming is the tendency to give a decision by a commander (troop leader) or event from the past the form it would have at the present time, giving it the trappings of the present, rather than the past. Such "liberties" are inadmissible in a scientific study. An evaluation of the correctness or incorrectness of a decision by a commander, an evaluation of a combat or operation, must be made on the basis of a thorough analysis of the specific conditions prevailing at that time.

An analysis of facts and conclusions must occupy a special place in this type of studies in military history. The researcher must remember that a simple description of facts without their analysis is purposeless. As is well-known, a past battle or operation are never repeated. Accordingly, only conclusions and lessons drawn from an analysis of study of battles and operations have any value.

Facts, however numerous, varied and interesting they may be, in themselves still do not constitute what merits the name of science. These facts are no more than a heap of bricks and stones from which one must construct the edifice of science. Moreover, science is born from an analysis of a multitude of facts. Only on the basis of analysis can one approach to the determination of laws, principles and rules. The analysis of events and facts in military history should be directed specifically to these ends. It is necessary to discover what can be learned from the investigated combat experience, not transform the study "into passing sentence" on some military leaders. Every operation has something distinctive, different from others, its "particular zest". It is specifically this which is of interest for study. Accordingly, in the conclusions the author should emphasize the revelation of the peculiarities of the particular operation, that is, what it can give for the development of military art and the value of its experience must be demonstrated.

8. Use of Experience From Army Exercises and Maneuvers

An intelligent use of the experience of exercises and maneuvers carried out under plans for combat and operational training is of great importance in

military science work. The value of these measures as an object for military science research is basically that they are conducted with the combat equipment and armament and with the organizational structure of forces which exist at the present time.

However, it must be remembered that exercises and maneuvers are conducted without a real opponent. Moreover, they can also have other aspects of unreality, such as an incomplete supply of equipment and armament, a restricted availability of vehicles, limited area for the exercises or maneuvers, etc.

In working on his topic the researcher must study the reports and materials originating from the particular exercises and maneuvers or personally observe them.

In order to visualize clearly what data can be obtained as a result of studying the materials or personal observation of different kinds of exercises, one must know the objectives for which the exercises or maneuvers were conducted.

Two-sided combined-arms exercises and troop maneuvers come closest to combat conditions. Accordingly, it is no accident that researchers strive to obtain materials for such exercises or personally observe them. This effort is undoubtedly justified, but it must be remembered that in some cases very valuable data can also be obtained in the course of other exercises, even those which are conducted without the use of troops or with the use of very limited numbers of troops. One should undertake the study of materials from such exercises or make personal observations of these events only after having studied the literature on the topic, after drawing up a working plan and after having studied archival materials from past wars. After performing this work, the author determines the direction of the research and the total number of problems which must be investigated in his proposed work. This will enable him to make definite judgments on a number of problems involved in the research and those problems for which solutions must be found in the actual practice of combat training of troops. As a result, the researcher does not arrive at the exercises uninformed, not feeling his way, but with a definite point of view, intentions and plan, but the most important thing is to be theoretically prepared, to accumulate experience in research work on documents, to be able to

compare the experience of the past with the present-day status of theory and practice on different problems, be able to make a critical approach to the prevailing situations and be able to detect and define new theoretical and practical propositions.

In studying the materials from exercises the researcher must always bear in mind the definite limitations of exercises and that these materials accordingly must be thoroughly analyzed and compared with other data. Only then can the researcher properly draw conclusions and use them in a military science study.

In evaluating the materials from exercises it is most important to determine to what degree they were similar to real combat conditions and whether there was any oversimplification of "coaching" of the troops. If this occurred, the materials from such an exercise lose a considerable amount of their value and they must be used with great caution.

Another important requirement imposed on the use of materials from exercises is that when studying a single problem it is necessary to take the experience of a number of exercises, not one alone. The greater the number of exercises analyzed, the less is the danger that the researcher will draw improper conclusions. The use of a sufficiently large volume of data from exercises will also facilitate to a considerable degree the reduction to a minimum of the negative aspects of exercises, that is, that they are conducted without presence of a real enemy.

However, in some cases a small number of exercises may provide adequate experience. For example, for determining the time for outfitting a batallion area in the depth of our defense by the personnel of the batallion or the expenditure of ammunition for knocking out various types of enemy fire power it is adequate to have the experience of two or three exercises.

In the course of the work preceding the study of materials from exercises the researcher determines the direction of the research and all the problems which must be solved.

Materials from exercises can be used for illustrating and confirming various principles, as well as for determining the timeliness of the problems investigated by the author. Study of materials from exercises makes it possible to check the correctness of the selected direction in the study, lay

out other approaches to the problems to be solved and detect new and timely problems which require scientific solution.

Before proceeding to study the materials from exercises the researcher must determine which data he wishes to obtain as a result of this work. For example, in working on a topic on the breakthrough of enemy defenses the objective of study of materials from exercises can involve obtaining data on the width of the breakthrough sectors, the depth of combat missions, structure of combat formations and the rate of attack by forces. These data, compared with the data from past wars, enable the researcher to detect definite tendencies.

The proper determination of criteria and circumstances from which the researcher will proceed in the selection of various data is of great importance in studying materials from exercises. If this requirement of dialectic materialism on the causal relationship of phenomena is not adhered to, the researcher inevitably arrives at incorrect conclusions. Accordingly, in studying materials, such as the width of the breakthrough sector, they must be grouped on the basis of uniformity of such conditions as the operations of forces in primary or secondary directions; degree of silencing of enemy defense; combat missions of forces; nature of the terrain, etc.

In this connection, the materials from exercises, even when the researcher formulates as his objective only the acquisition of certain definite data, must be studied as a whole. This study is also necessary because in a number of cases it makes it possible to determine the most desirable ways to solve the investigated problems or define new and timely problems requiring scientific solution.

One of the fundamental requirements in a study of materials from exercises is a thorough and profound analysis of these materials. The ability of the researcher to detect the appearance of something new, such as determining a noncorrespondence between the form and methods for conducting combat operations and combat weapons, doing so on the basis of the most insignificant hints, is of great importance. In order to do this the researcher must have excellent theoretical preparation and be able to evaluate existing situations from a critical point of view.

When using materials from exercises in no case is it admissible to make a special selection of certain data to fit the author's preconceptions.

Moreover, one must have adequate scientific integrity and boldness so that when data from exercises quite convincingly indicate the incorrectness of the researcher's judgments he will discard them.

It is desirable to take from the experience of exercises not only the positive aspects, but the negative ones as well. In many cases where there is no answer to a formulated question, when the troops were not able to solve a particular problem successfully, the researcher stands on the threshold of a new discovery, the attainment of a major scientific result, provided he does not allow this to escape his attention.

In some cases when studying materials from exercises the researcher has questions whose answers cannot be found in these materials. Accordingly, it is desirable to consult the direct participants in the exercises or other individuals who observed the exercises. The materials obtained as a result of such conversations must be compared with other data because an evaluation of exercises by their participants inevitably has a subjective character and some of the facts which they report can be inexact.

The nature of the use of materials from exercises is dependent on what purpose the researcher will use them for in writing on his operational-tactical topic. When these materials are used for confirming new principles advanced by the researcher, data from a number of exercises must be cited, together with a concise description of the conditions under which the exercises were conducted. It is also desirable to compile tables and diagrams and give a description of the exercises in the form of an appendix to the study in military science. If the materials from exercises have been published it may be adequate to simply footnote the fact of their publication.

When the materials from exercises are cited solely as an illustration of certain reasonings or for confirmation of existing principles, in this case it is customary to make a brief reference to some exercise. However, if one example is cited it must be a typical example, that is, the data from this example must be confirmed by the experience of a number of other exercises.

The personal observations by the researcher of the work of commanders, staffs and the operations of forces during exercises can yield extremely valuable results.

Despite the fact that during the study of materials from exercises a considerable amount of data can be obtained at once or in a relatively short period of time, it must be remembered that in some cases they will not fully correspond to the requirements which the researcher imposes on them. This occurs because the writers of reports on exercises are guided by objectives which may not coincide with the researcher's objectives. For this reason personal presence at exercises and observation of their conduct have the advantage that the researcher is able to select personally the material which he requires.

One must also not overlook the important factor that personal observation of the work of commanders and staff, the operation of forces and their use of various kinds of weapons and military equipment favor the focusing of theory and practice, enables the author to study better the needs of the forces, makes his mental process more objective and broader, and thus to a considerable degree ensures successful work on the topic. Personal observation at exercises is therefore an extremely desirable step in a study in military science.

The results of personal observation of the work of commanders and the operations of forces are dependent to a considerable degree on the researcher himself. Examples are known when several officers, visiting the troops during exercises, evaluate them differently. Some declare that there was nothing of interest to observe, whereas others state that there was a useful purpose; still others find some instructive points and successfully apply them in military science work.

Experience shows that the ability to collect materials and analyze the operations of forces during exercises, as well as success in general in military science work, is directly dependent on the degree of theoretical preparation and the personal experience of the researcher.

Personal experience consists of combat experience and the practical experience of commanding forces by the researcher himself. It is difficult to exaggerate the importance of this experience. At the same time, it does not mean that work on such a subject as operational art is the exclusive prerogative of men who have commanded fronts and armies. It would also be absurd to require from the researcher that he be a participant in those wars whose experience he applies in writing on a topic. However, the existence of

a certain minimum of practical and combat experience must be considered necessary for the researcher.

In a case when a researcher relies in a study on his personal experience, it, like other sources, must be approached critically; this is because it may be biased or to a considerable extent outdated.

However, in order to see the most interesting aspects of exercises and collect valuable material the researcher must have certain skills in working in exercises to supplement his theoretical preparation and personal experience.

Prior to departure for an exercise the researcher must determine the basic data which he desires to obtain. It must be remembered that the researcher's possibilities of personal observation are limited and accordingly one can not set himself the objective of seeing all aspects of the exercise.

Departure for an exercise must be arranged in such a way that the researcher will arrive at the site of the exercises several days before they begin. During this time he must become familiar with the basic materials of the exercise. Particular attention must be devoted to a study of the intention and plan of the exercise. This will make it possible for the researcher to determine the conditions and the aspects of the exercise of greatest interest to him.

A study of the area of the exercises also favors the successful solution of this problem to a considerable degree. In studying this region, one must thoroughly analyze the terrain conditions from the point of view of their effect on the operations of forces. In particular, one must determine the places where the forces will meet with the greatest difficulties because frequently it is precisely there that one can observe instructive aspects of the exercise.

The study of the exercise area should begin with map study. This enables the researcher to evaluate the entire region. Then, if possible, he should make a field trip for refining his evaluation of the terrain directly in the exercise area.

As a result of study of the intention and plan for the exercise and the region where it is conducted, as well as on the basis of an earlier prepared list of the data which the researcher desires to obtain, it is desirable to

draw up a personal working plan for the exercise. The working plan is drawn up in arbitrary form, but it must stipulate where and when the researcher will make his observations, what he will endeavor to see, and what data should be obtained at this time. The plan is refined during the course of the exercise as necessity dictates.

For example, in a tactical exercise of a subunit, in the course of a pursuit executing a forced river crossing, the researcher's work can be planned in the following way. In the initial exercise area the researcher observes the work of the commander and staff of the subunit until the decision is made and the missions are assigned to subordinates. Then he departs for observing the work of commanders of subunits and the preparation of troops for executing the assigned missions. During the course of the pursuit he is with the troops, successively moving into those areas where the subunits will execute various missions: annihilate the retreating enemy, overcoming various obstacles and destruction, eliminating the after effects of an enemy atomic attack, repulsing his aviation, etc.

Then, before the subunit commander makes his decision to cross the river, the researcher plans his return to the command post. When the decision is made he proceeds to the river for the purpose of observing its forcing by the subunits. His subsequent work is planned in dependence on the formulated study problems.

His plan for being in a particular place at a particular time are made in accordance with the plan for the exercise and are refined during the course of the actual exercise.

Since the opportunities for personal observation are limited, the completeness of data on the exercise, which later will enable the researcher to analyze the results of his observations thoroughly, is dependent to a considerable degree on the materials which are delivered to the headquarters by the umpire (military control officer).

Experience shows that these materials are usually prepared in some arbitrary form and without a definite system. This complicates the researcher's work in his final systematizing of the results of observations of the exercises. For example, one can often meet with such situations as when a report tells of the work of a commander in formulating a decision but

without telling how much time was spent in arriving at this decision or it may indicate the time but fails to describe the sequence of the commander's work.

In order to avoid such cases, it is desirable that the researcher determine what problems must be included in the umpire's materials. Questions can be prepared both for the entire group of umpires participating in the exercise as a whole, as well as for individual umpires participating in definite aspects of the exercise. The researcher correlates his questionnaire with the directors of the exercise and sends it to the umpire group through staff headquarters.

The personal preparation of the researcher for the exercise is of quite some importance; reference is to his outfitting and supply with the necessary instruments and other tools.

The requirements on field uniform are general and the researcher must adhere to them. Since he must be out of doors for a long time, during winter the researcher must wear padded boots and a sheepskin coat. Warm gloves must be of a type permitting the taking of notes without their removal. If such gloves are unavailable, light gloves and warm mittens must be available for periodically warming the hands.

In summer it is essential to take to exercises a poncho and waterproof boots.

When rainy weather is expected it is desirable to have ordinary pencils, rather than chemical pencils, notebooks with thick paper, and a reversible plotting board with celluloid sides for safeguarding maps against moisture.

All the working notebooks in which secret notes are made must be appropriately registered.

Mandatory equipment includes binoculars, a compass, watch and stopwatch. If the researcher has been granted permission to take photographs or movies during the exercise it is necessary to make appropriate preparations of the equipment and miscellaneous materials. A flashlight must be taken for making notes at night.

In making ready for an exercise it is desirable that the researcher obtain a map at staff headquarters and while studying the intention and plan of the exercise plot the fundamental aspects of the exercise on this map. It

is very convenient to write one's own working plan on this same map. The points from which the researcher intends to observe the operations of troops can be plotted on this same map and the approximate times for working at these points can be indicated. The exercise problems which the troops are to execute and the purpose of the observation can be indicated in the legend.

The preparatory work is of great importance, but it is secondary to the work done directly during the course of the exercise. The researcher must at all times know the situation during the exercises if he is to be successful in his personal observations and the collection of the required materials because the exercise plan is worked out in general form and the details of the course of the exercise are developed as a result of decisions by commanders and the actual operations of the troops. The researcher must obtain information at staff headquarters and at the staffs of the forces participating in the exercise in order to at all times be aware of conditions and know where certain events will take place and for what purpose.

Note taking is of great importance when observing the work of commanders and staffs and observing the operations of troops.

In many cases researchers err in not taking careful notes. Experience shows that one's memory cannot be trusted. There is no use in complaining of the lack of time and energy for detailed and clear recording of observed facts. When making notes the emphasis should be on detailed exposition of the facts. At a later time it is better to draw a conclusion on the basis of detailed notes than to have a conclusion alone, without availability of the data on which it was based. Moreover, a hasty conclusion can be incorrect. During exercises, in order to save time, it is desirable to draw various diagrams, such as of the decision of a commander with a brief legend.

When time is available during the course of the exercise the researcher should familiarize himself at staff headquarters with materials presented by the umpires.

In analyzing an exercise one must carefully write down all the evaluations which the exercise director transmits to commanders, staffs and troops. At a later time, when analyzing the exercise, this will enable the researcher to compare his own point of view with the evaluation of the exercise director.

After termination of the exercise it is desirable to familiarize oneself with all its materials. At this time the researcher can study the materials of the headquarters staff, assistant directors of the exercise for the various arms of service and special forces, the group of umpires and the staffs of troops participating in the exercise. Necessary notes must be made during the course of this work and copies must be made of maps which show the conditions, decisions of the sides and operations of the forces.

Then the researcher makes a careful analysis and comparison of the results of his personal observations with these materials and draws definite conclusions which subsequently will be used in his military science study.

Since every exercise has a definite value for others, as well as the researcher, the results of his visit to the exercise should be communicated to the officer personnel of the institution or unit to which the researcher is assigned or to a broader group of individuals. This can be done by means of a report or by writing a short article in the periodical military press.

At the same time, this will facilitate a more thorough analysis of the results of the exercise by the researcher himself and when writing the article he is enriched by the experience in performing work in the field of military science.

9. Collection and Systematizing One's Own Materials

In studying the literature and the materials from exercises collected during the direct participation in exercises, scientific conferences and meetings and when conducting exercises, an intelligent collection of materials is of great importance, as is the recording of one's own thoughts and their proper arrangement in systematic form. It should be emphasized that this is creative rather than mechanical work.

The writing down of the researcher's own thoughts is of great importance. Unfortunately, it must be said that inadequate attention is frequently devoted to the recording of one's own thoughts. This is inadmissible because one's own thoughts and ideas are the most valuable product of the researcher's creativity. If not written down at once they can be lost. In other cases one may forget a number of details of the basic idea, but without these details the particular idea loses a considerable part of its value.

The process of creativity always continues, frequently even after the work has been written. General Lavochkin, the famed aircraft designer, has expressed himself in an interesting way on this point: "Try as I will, even in my sleep I cannot escape from my machine. At times I draw diagrams and make computations. Sometimes in order to rest I try to 'escape' from my machine for an hour and go fishing, but my thoughts pursue me even while fishing" [22]. In order for one's thought, coming upon the author at any time, to be written down by him, he must always have with him a pad, notebook, pencil or fountain pen. Naturally, one must adhere to the rules for safeguarding national and military secrets.

The making of notes and their arrangement in a definite sequence favors the better comprehension and assimilation of what the researcher is studying.

In studying various sources researchers frequently fail to make notes because they feel that everything in the investigated problem is clear. However, this is a serious error. In actuality, the investigated problem is readily understood, but there is a great difference between understanding and a profound and thorough assimilation. Only when the investigated work is attentively studied with a pencil in the hand and written down in one's own words can it be assumed that it has actually been studied and later will be successfully used in the military science work.

Note taking makes it possible to record one's own thoughts or some data in a precise fashion; in turn, this frees the brain from being overburdened by the need for remembering these facts for a long period of time.

Regular note taking also favors the forming of a critical approach to the studied events and facts because even with a simple but concise exposition of the studied material in one's own words the researcher must make an analysis and this is inseparably related to a critical comprehension of the investigated phenomenon.

In collecting materials one must exploit all available opportunities. We have already discussed the matter of taking notes during the study of the literature, materials from exercises and archival materials.

Many interesting ideas can be obtained when engaging in exercises with officers. At such exercises it is common for original ideas to be expressed

on various problems which are worked on during the exercises. For a person taking part in an exercise, in the course of examination of various questions and during the discussion of solutions proposed by the students, new ideas are frequently advanced, as well as solutions of problems in a different light than was visualized earlier. If all this is not written down by the researcher at once and is not subsequently analyzed and not compared with other data, everything of value which could be drawn from the exercises for military science work will be irretrievably lost.

When attending lectures one must write down not only the fundamental points of the material presented by the lecturer, but also various thoughts arising at this time. In many cases valuable material can be obtained as a result of a conversation, especially with well-trained comrades.

It is desirable that careful notes be made when participating in various kinds of scientific conferences and meetings. It is interesting to write down the opinions of speakers and the course of the discussion so that this material can be compared with other material at a later time.

The subsequent study of all the collected materials, their analysis and comparison with one another, in the long run will enable the researcher to draw definite theoretical conclusions on his selected topic. Even those materials which will not be directly used can favor the appearance of new thoughts.

When making notes the researcher should formulate a definite system, particularly when collecting materials on a number of problems. If this is not done it will be necessary to make an additional study of the various materials in order to supplement those data whose collection was not taken care of by the researcher at the proper time. For example, when studying the question of troops crossing bridges constructed from heavy pontoon river-crossing components, one author did an extremely great amount of work. However, he later found that he had overlooked such an important point as the speed of movement of troops when crossing bridges. Accordingly, he had to make an additional study of this problem and this resulted in an unproductive expenditure of time.

The researcher's mastery of a definite technique of note taking is of great importance. Some advice can be given with respect to this problem. However, for the most part the technique of note taking is formulated by each researcher by himself, the technique being whatever he considers desirable for himself.

The notes must be concise and clear. The taking of extensive notes reduces the study process to mechanical work. Attempts to write down a lecture, report or conference word-for-word inevitably has the result that the material is not assimilated creatively. In this case the researcher will strive only to write down what he hears rather than attentively thinking and analyzing the material.

The written text must be arranged in a definite system enabling the researcher to find the necessary places without delay. New thoughts must begin with a new paragraph. Individual words which have great literal significance should be underlined.

The ability to use colored pencils can have a good effect. For example, in the notes everything which applies to a group of problems on the principles of military operations can be marked with a black pencil, everything applying to a group of problems on organization can be marked with a blue pencil, and those materials relating to problems of the waging of combat operations can be marked with a red pencil.

In some cases it is possible to make the notes more graphic and at the same time use less time, that is, various diagrams and tables can be prepared. The military researcher must make very frequent use of the method of drawing diagrams.

All the notes must be dated. The place, day, month and year of the note must be indicated.

A note, if made by hand, must be written with sufficient clarity. Otherwise, after some time the researcher may be unable to read what he himself has written.

Notes must be made brief, but without an arbitrary abbreviation of word endings. The use of abbreviations in order to save time in notes can be done in accordance with a certain system.

It is desirable to use abbreviations adopted for the field service of military staffs. For example, instead of writing "antitank reserve", one can use the abbreviation (in Russian) abbreviation PTR. One can also use an equal sign, plus, minus, etc. Moreover, the researcher can develop a number of abbreviations for his own particular use. For example, the words

"forward edge" can be abbreviated by the first letters (in Russian) PK, "first zone of defense" by abbreviation PPO, etc. At first there may be only a few such abbreviations and not much thought may be given to them; however, such hastily devised abbreviations are quickly forgotten and as a result the researcher cannot read his own notes. The building up of new abbreviations should be done gradually, first fixing them in mind and then introducing them into the notes. They must not be changed at a later time.

One's own materials must be arranged and stored in a definite sequence. Only then will it be possible to find and use these materials quickly.

One's own materials can be put into systematic order by using notebooks or special cards. The selection of a system is dependent on the individual inclinations of the researcher and also on the nature of the collected material. Naturally, notes having a classified (secret) nature must be stored in accordance with the requirements for the safeguarding of national and military secrets. The taking of notes in specially designed notebooks best meets these requirements.

When making notes in notebooks one must allocate a definite number of pages for different sections and subsections for which the collection of material is planned. An adequate number of pages must be allocated and paper must not be spared. Otherwise, when the pages allocated for a section are filled it will be necessary to encroach on pages allocated for other sections. As a result, the formulated well-devised system will be disrupted.

Notebooks on definite topics and subtopics must be grouped in cases for convenience in finding the material. When a sufficiently large number of notebooks is avilable and they contain a considerable number of different sections it is desirable that a catalog be prepared in which all one's notes are listed by numbers of cases, notebooks and pages.

A positive aspect of keeping notes in notebooks is that it trains the researcher in neatness and forces him at all times to classify his notes in accordance with a definite established system.

At the same time, this notekeeping method has its negative aspects. Sometimes a large number of notebooks must be carried for the study of some particular problem. The materials cannot be laid out on the table so that they

can be scanned as a whole. The researcher is frequently forced to carry various notebooks, leafing through them in order to find the necessary materials. All this distracts the researcher and interferes with his thought processes.

Notes can also be made on cards of a format selected by the researcher. The card can be half the size of a sheet of typing paper. Notes on cards are made basically the same as in notebooks.

Only one problem, one thought, one citation or annotation to a book or article must be written on each card.

The cards can be of several colors, for example, notes on matters pertaining to military theory can be made on cards of one color, whereas notes on military history can be made on cards of a different color.

The cards are grouped in accordance with a definite system, usually with their content being the basic criterion. Then they are fitted into boxes fabricated in the style of library catalogs or they are filed in paper or cardboard pieces.

P. V. Kozhevnikov, Corresponding member of the Academy of Medical Sciences USSR, on the pages of his book [23], gives valuable personal experience in the use of a card system. All the cards prepared by him are arranged in groups. Cards are combined for individual topics and put into a single case formed from a sheet of paper or cardboard folded in half. Since there are more than 300 such basic cases, he prepares a list of these files. In conformity to this list all the basic filing cases are numbered and arranged in numerical sequence. In case of necessity the author finds the number from the list and retrieves the necessary material from the special boxes where the cases are stored. Only one or two minutes are required in order to retrieve the required group of notes which P. V. Kozhevnikov has now collected for more than 25 years. This is absolutely impossible when notebooks are used because the author's notes, now available on more than 30,000 cards, would be scattered through a great many notebooks.

10. Summarizing Research Results and Formulating Basic Conclusions

The collection of materials is an important stage in military science work. However, one cannot tarry too long on this stage at the expense of the time

planned for summarizing the research results and formulating the basic conclusions. Unfortunately, one frequently encounters such situations. As a result of the pursuit for the collection of a large volume of material in some cases researchers fail to complete work on the topic at the appointed time. A still more negative aspect is that when there is a shortage of time for summarizing the results and formulating new theoretical principles, this exceedingly important and responsible stage in the work is done hastily and therefore its quality is not sufficiently high. At the same time, precisely during this stage all the preceding work is summarized and the fundamental material is created which will determine the value of the research project.

Accordingly, it is better to collect less material and have fewer facts but analyze them in sufficient depth and with adequate thoroughness. It is better to draw sound conclusions and proposals than to cite a great many different facts, but for the most part present nothing more than this. At a later time, as necessity arises, the lacking material can be collected.

Before proceeding to a summarization of the research results, it is necessary to examine all the collected material attentively and refine its arrangement in a definite logical sequence. At this time certain problems can become clear which it may be desirable to study in a future investigation because it may well be that no one has ever yet investigated them.

In summarizing the results and formulating the basic conclusions time should not be wasted on proving already known truths. Unfortunately, such errors are tolerated even by researchers who have a certain amount of experience in military science work. The authors of dissertations find themselves in an extremely difficult position in this case during the defense of their dissertations and the authors of such articles usually receive a negative response from the editors to a request to publish such studies. Known principles must be presented and thoroughly validated only in cases when they are being subjected to reexamination and criticism and the researcher, in studying them, feels that this should not be done.

Basic attention must be focused on a bold presentation of new points or principles and the further development of military theory. This must be done without fear of criticism. In any study in military science it is new points or principles which must be the basic content and they must not be drowned

or eclipsed by secondary matters, particularly those already well discussed. The researcher must concentrate his main attention on a thorough validation and proof of the new theoretical conclusions and proposals. At the same time, care must be taken to see that operational-tactical proposals are based on the capabilities of military equipment; otherwise these proposals "will hang in the air" and serve no purpose whatsoever.

The thorough validation of the points advanced by the author is of particularly great importance in a military science research project. In many cases the author feels that the point which he advances is undoubtedly correct and therefore there is no need to validate it. However, when he attempts to give a thorough validation of this point, he discovers with surprise that it has weak places which sometimes either require a total discarding of the point or require further work during which the point experiences various refinements and changes. Moreover, experience shows that in some cases the presentation of an inadequately validated point for discussion by the scientific community can sometimes lead to the collapse of even a valuable idea and shake the author's faith in this idea, as well as shaking the faith of others.

An intelligent scientific validation of the principles or points advanced by the author requires a certain amount of experience and proper methodological development of a problem. If experience has been inadequate and the work is done without an advisor, the researcher must study all other published works of a similar nature for the purpose of familiarizing himself with the methods used by other authors so that he can correctly determine how to approach the validation and exposition of his topic.

In summarizing the results of the work, all the facts and various kinds of data with which the researcher will work must be carefully checked. In no case is it admissible to use data from an inadequately checked source. Both the deductive and inductive research methods must be used intelligently during the course of the work on summarizing the results.

If a researcher has advanced a working hypothesis, on the basis of a general idea he will select (naturally, not preconceived) phenomena and facts corresponding to this idea, that is, he will use the deductive method. However, this working hypothesis advanced by the researcher will usually be the result of his study of certain individual phenomena and facts. In another

case, on the basis of an analysis of the collected materials, the author arrives at generalizing conclusions from the analysis of individual facts, that is, he will conduct his research by the inductive method. However, as soon as he advances a definite theoretical point, he can require additional special facts and data for confirming this point. Accordingly, the deductive and inductive research methods are inseparably related and both are constantly used in summarizing the results of work.

In order for the advanced theoretical points to be based on properly selected data and facts, the latter must not only be carefully checked, but also properly grouped in relation to a number of criteria, particularly the most important. For example, in a study of the structure of the combat formation of a regiment during an attack during the breakthrough of a prepared enemy defense it is impossible to apply all data obtained from exercises. In this case it is most important to take into account the combat mission of the regiment, the width of the breakthrough sector, the nature of the enemy defense and the extent to which it was crushed, the manpower and equipment available to the regiment and the nature of the terrain, since the structure of the regimental combat formation will depend to a considerable degree on all these conditions. Naturally, the deeper the combat mission, the deeper must be the structure and disposition of the regimental combat formation and the broader the breakthrough sector, the greater must be the manpower and equipment allocated to the first echelon or instead there must be a single-echelon formation, etc.

In an analysis of one's own materials the determination of definite tendencies and patterns in some phenomenon is of great importance. In this case a careful analysis and selection of the facts is particularly necessary. In some cases it is desirable to compile tables and draw diagrams which will make it possible to represent graphically the development of a particular event.

Objectivity in research requires an attentive and conscientious comparison of one's own thoughts and ideas with other materials and data on these problems. Materials which contradict one's own conclusions must be examined with particular care. In no case can these materials be neglected. On the contrary, one must without any regrets reject his own ideas and assumptions if they prove to be incorrect. However, this is done after a thorough analysis of the

material because there is nothing worse than the rejection of one's own ideas hastily as soon as the researcher finds contradictory data. Along these lines it is fitting to recall that nothing new is born without a struggle with the old and that the struggle of contradictions is a characteristic of development.

When summarizing the results of the work the material must be organized in a definite sequence and interrelationship. This requirement applies to topics both in military theory and military history. For example, in a study in military theory devoted to the use of parachute troops one must first determine the conditions under which parachute troops can be dropped and then proceed to an examination of the possible nature of their combat missions, not the other way around.

The determination of a causal relationship between phenomena during research makes possible the most correct clarification of these phenomena. Moreover, material which is presented with adherence to this requirement is more understandable and comprehensible when studied.

The final, most important and most difficult part of research work, is the formulation of conclusions. Conclusions are the result, the final product of research. A great amount of material and facts can be collected but if one cannot arrive at scientifically sound conclusions all the work which has been done is useless or in any case is of limited value. The number of conclusions must not be too great. The value of conclusions is not governed by their number or length, but only by their content. Definite requirements must be observed when formulating the basic conclusions from research results.

The conclusions without fail must logically follow from the material already presented. A situation in which when summarizing the results on some problem some practical proposal is set forth but it, so to speak, "hangs in the air", since in the material preceding the conclusion the researcher had failed to build the necessary foundation for it.

In the formulation of conclusions there may be cases when the researcher arrives at some conclusion not foreseen earlier. If it is important and must be given in the study, in an appropriate place one must present the necessary material and then draw a conclusion on its basis.

Conclusions must not be based on the assumptions and fleeting impressions of the researcher, but on the basis of irrefutable, precisely established facts and data. Conclusions precisely established by the author must be presented separately and distinctly from the conclusions of a hypothetical nature which in his opinion still require additional checking. This ensures objectivity in the research, is a safeguard against incorrect proposals and at a later time makes it possible to refine different conclusions.

It is desirable that the conclusions be multisided, examining the investigated problem not only from different points of view, but insofar as possible also considering other related problems in military art. For example, when developing methods and forms for conducting some type of military operations, the conclusions must give recommendations not only on the investigated topic, but also proposals on armament, military equipment and organization of troops. The fact is that the development of new or the improvement of existing combat techniques, combat weapons and principles for the organization of troops are dependent to a considerable degree on the requirements of tactics and operational art. At the same time, the researcher must know the level of development of engineering and production so that engineers and production men will not be called upon to perform tasks beyone their capacity. Moreover, rash and thoughtless proposals must not be made. For example, sometimes facts are encountered when the researcher, on the basis of work solely on problems relating to combat equipping of troops attempts to make proposals on the organization of lesser combat units and groupings of units as a whole. It is entirely clear that such attempts are unsound. Serious, well-founded proposals on troop organization can be made only when the researcher has studied the entire range of problems related to the nature of execution of various combat missions by units and groupings of units.

The conclusions for different problems in the researcher's topic must be clearly discriminated. Proposals on methods for waging combat and operations, on the control of forces, requirements on combat methods and combat equipment, etc., must be presented separately from one another.

The conclusions must be concise and presented in a convincing way. It is undesirable to cite examples in the conclusions. Conclusions without fail must follow from a definite system of validation; otherwise they will probably sound extremely unconvincing.

The result of summarization of the results of the work and formulation of the basic conclusions can be expressed in the writing of a scientific communication or summary whose material must be made available in the form of a report and written abstracts for discussion by the scientific community and for practical checking in the army. However, if a small study in military science is produced, such as an article, there need be only discussion of its basic content.

11. Checking Research Results

Checking of the research results is a necessary and important stage in the overall process of research in military science. Depending on the nature of the topic, the purpose of the research and opportunities, the checking must be done in the form of an expert scientific review, discussion, critical review, display of the research results on maps and checking in special exercises.

Discussion and critical review of the research results or the literary presentation of the work is the easiest form of checking and should never be dispensed with.

The essence of discussion and review is that the author's research results, which until then could be known only to him or a small group of others, are made available to outsiders.

Opinions are expressed to the author on his work by a number of individuals who have different attitudes and opinions concerning his proposals. In addition to agreement or disagreement with the points presented in the study, the reviewers make their own proposals and provide certain sound opinions.

As a result of the discussion, the author usually receives a large number of comments; in their content these comments in general involve an acceptance, development or validation of the points which he has presented or their refutation and a criticism of the validation system, or they may even involve new proposals and new proofs.

After receiving such comments, the author naturally cannot agree with all of them, if for no other reason than that many of them contradict one another. In such cases some authors readily agree with positive proposals, accept them and at the same time easily reject comments of a negative nature.

Certainly one cannot accept such an approach to discussion materials as being correct. The author must attentively examine all comments with the same degree of care because no comment will be made without sound reason.

Even when comments are obviously incorrect there is need for serious thought because they are usually not made without reason and the principal reason is usually that the author has failed to present adequately convincing truth. Accordingly, by a critical study of such comments the author can strengthen or even replace the system of validaton and proof which he employs.

A major shortcoming in the acceptance of comments by reviewers by some authors is their failure to make a thorough analysis of all comments and particularly general comments applying to the entire study. For example, in reviews and in oral comments during the discussion of a major study it was pointed out to one researcher that many points in the study have remained undemonstrated and then this was illustrated using one of the examples with reference to a definite page.

The author, upon receiving such comments, rather than making a thorough analysis of his entire system of proof and validation, made some corrections and the page mentioned as an illustration by the critics and reviewers. Naturally, such a situation must not be tolerated.

Reviewing does not essentially differ from discussion. However, whereas the latter can be based on an oral report, the research results must first be finalized in written form before a review is undertaken. Moreover, during the discussion a speaker may express his opinion not only on the content of the study, but also on the comments of other critics, something which favors the productive development of creative discussion. However, as a result of a review the author receives a definite number of written commentaries.

It is entirely clear that discussion and reviewing can give positive results only when the critics and reviewers make a thorough study of the entire work and comprehend it well. A correct judgment concerning a study cannot be made without studying it in its entirety, familiarizing oneself only with part of the material. Moreover, in this study method it is possible to give only superficial recommendations, sometimes even harmful suggestions. The judgments of speakers at a discussion and reviewers must be sound, well-grounded and expressed in a tactful way without any bias. Only in such cases

can they be of definite advantage to the author. Such comments as "unpleasing", "something's wrong here", "doesn't sound right", are of no value and cannot be regarded as evidence that the author has written anything incorrectly.

Negative reviews and comments, in particular, should be very well substantiated. Along these lines very instructive comments were made by M. V. Lomonosov more than two hundred years ago to a Leipzig reviewer who had attempted to distort a new theory of heat proposed by Lomonosov. Mikhail Vasil'yevich Lomonosov wrote: ". . . here are the rules which we feel should finalize this discussion and which we advise both the Leipzig journalist and all his fellows to master thoroughly:

1. Whoever takes upon himself to communicate to the public the content of new research should first evaluate his capabilities because he is undertaking a work which is difficult and extremely complex, whose objective is not conveying known matters and general truths, but to be able to cover what is new and important in published studies which sometimes have been written by persons of genius. Their discussion in an incorrect or unreasonable way is to subject oneself to scorn and ridicule and such a person is like a dwarf who would like to lift the globe on his shoulders.

2. In order to be in a position to give a sincere and correct appraisal it is necessary to free one's mind from any bias or any preconception . . .

3. Communications on which a report is given should be classified into two types: the first includes communications written by one author who publishes them as a private individual; the second includes those studies published by whole groups of individuals with common consent after their careful examination. Naturally, both merit attention and respect from the critic. There is no published study which does not require adherence to the natural laws of correctness and propriety. However, we must agree that twice as much care must be exercised with respect to writings already bearing the seal of high approval, reviewed and deemed worthy of publication of individuals whose combined knowledge naturally exceeds the information available to a journalist, and before he decides to point out shortcomings and condemn he must repeatedly weigh what he intends to say so that he will be in a position to support and justify his words if the need arises . . .

6. A journalist may refute that which in his opinion merits it in newly appearing publications, but this is by no means his real business and not his

direct vocation. However, whoever takes it upon himself to do this should be entirely familiar with the thoughts of the author and analyze all his proofs and counter them with real, valid objections and fundamental arguments before he considers it his right to condemn the other. Some doubts and spontaneous questions do not give this right because there are plenty of ignoramuses who can bring up far more questions than even the most outstanding person is capable of answering. The journalist should not particularly object that something is unclear or inexplicable to him in the case of an author who might have had his reasons for shortening or omitting certain information or details.

7. Finally, he must never have too high an opinion of his own merits, his own authority and the excellence of his own judgments. His review in itself is already unpleasant for the pride of those whom it affects; on his part it would be very imprudent to insult their intentions and force them to reveal his incompetence" [24].

A review must give a thorough evaluation of the scientific study with indications of its positive and negative aspects and indicate ways in which shortcomings could be eliminated and the direction which further research should make for the purpose of a significant improvement in the quality of the reviewed study.

Reviewers frequently reproach the authors of scientific studies for what they feel the authors have not done, whereas in general it is necessary to give an evaluation of a study from the point of view of what was done and how it was done.

Every comment in a review must be scientifically based, specific and with no possibility of double meaning.

Reviews can vary in form. In some cases they are given simultaneously for several published works, whereas in other cases only a single study is reviewed; only a general judgment concerning the study may be made or each section may be evaluated in sequence. The latter type of review is undoubtedly of the greatest value because in this case the author can see all his shortcomings.

However, despite the form selected by the reviewer, any review of a scientific study should cover the following problems:

-- timeliness of the topic and its scientific-theoretical and practical value;

-- to what degree the author was the master of his topic and whether he selected the proper research methods;

-- the extent to which the author developed his topic; what new points were advanced and whether they actually constitute a new contribution to science;

-- shortcomings of a methodological, literary and editorial nature;

-- ways to eliminate existing shortcomings and the direction for future research;

-- general conclusions concerning the study.

The graphic presentation of research results on maps is used in the research process at different stages in the study. The map is a constant companion to the author during his study of operational-tactical problems. He uses the map in studying archival materials and materials from exercises; he checks his hypotheses on a map and presents his research results graphically on a map. The presence of local relief and the basic features given at scale on a map assists the researcher in recreating the picture of a battle or operation existing in his imagination.

A map also provides the researcher with the opportunity for a two-sided checking of his hypotheses, that is, comparisons of our operations with the operations of the "enemy".

After discussing and reviewing studies on operational-tactical themes, it is desirable that everything be presented graphically on maps. Such graphic representation can be done during the course of various tactical exercises. It goes without saying that the more perfect the form of tactical preparation, the greater will be the possibilities for checking the points which the author advances.

The best results can be obtained when conducting those exercises in which there is a full opportunity for all the researchers to occupy key posts and actively speak out against the other side, making use of their own methods of argumentation and graphically demonstrating the merits and shortcomings of the points advanced in the scientific study.

However, the opportunities for presentation of research results by this method are relatively limited. Accordingly, the research results must frequently be checked during exercises in which officers will for the most part perform but a single assignment.

In this form of checking the person preparing the problem uses as his basis the essence of the results of the scientific research and then works this out on maps with a number of officers participating. The officers first familiarize themselves with the research results.

Without going into the details of this method for checking research results in these exercises, the following one-sidedness of this method must be noted.

Special exercises are one of the most valuable methods for checking research conclusions and results. The objectives and problems of these exercises are not determined by the interests of combat and operational training of forces, but by the formulated military problem, whose successful solution will later be used for the training of officers and generals and the instruction of troops. Accordingly, the researcher himself determines the theoretical principles whose value and correctness must be tested by practical work.

The elements of such an exercise can also be incorporated in an exercise conducted in the interests of combat training of troops. This can occur when some theoretically formulated problem which must be checked is included in the study program together with academic problems. For example, in the study of forcing a river, the delivery of some river-crossing equipment to a river aboard helicopters can be checked by way of an experiment.

The conduct of a special exercise requires careful preparation and considerable practical skills both in the organization of such an exercise and in the command of troops. Exercises and maneuvers are costly and therefore they must be organized and conducted in such a way that the formulated objectives will be attained. Along these lines it is fitting to recall the words of I. P. Pavlov that "It is not the number of experiments which is important, but the quality of observations".

The theoretical points advanced for practical checking must be first thoroughly analyzed and checked by other methods which are simpler and more

readily usable. Then it is necessary to use care in devising means and methods ensuring a thorough checking of these theoretical points during exercises.

As a prosecutor asks questions of an accused for a definite purpose, guided by well-known assumptions, and in any case not without reason, in exactly the same way the military researcher does not proceed to experimentation without certain assumptions formulated prior to the experiment. The experimental results themselves are interpreted as definite answers to extremely well-defined questions. It can be said that the entire difficulty in experimentation is in formulating questions which are as unambiguous as possible and obtaining unambiguous answers.

Since a number of theoretical conclusions are usually checked during an exercise or maneuvers, and since a considerable number of troops and considerable equipment is allocated for conducting them, observations of the operations cannot be made by a single person; a special group must be formed for preparing and conducting the work and collection of the materials during the course of the exercise and their generalization. This group should without fail include the authors whose theoretical points are being subjected to practical checking and also officers and generals having advanced theoretical training and practical experience in commanding troops.

The role of the authors or author, as well as the officers and generals called upon for conducting the exercise, and the distribution of tasks among them are dependent on the scale and nature of the exercise and a number of other factors.

In particular, the members of the group are obliged to work out initial data or a program for the exercise, that is, determine: the theme of the exercise; the theoretical problems to be checked; the requirements and the exercise area; the duration of the exercise; the makeup of the forces used in the exercise; the requirements for motorized vehicles for combat, personnel and transport vehicles, instructional and combat supplies, explosives, fuels and lubricants and other necessities.

The preparation of initial data for an exercise is an exceedingly important stage in the work. Everything must be provided for to the last detail. For example, an exercise does not achieve its purpose even when there is a correct definition of the theme of the exercise and the theoretical problems to be checked, if, for example, the motor vehicles and fuel supplies suffice for

conducting only part of the exercise. The situation is no better if the requirements and the area for conducting the exercise are determined in such a way that the troops cannot deploy along the necessary front and develop combat operations to the required depth.

In order for the initial data to be formulated most thoroughly and effectively it is desirable that during the course of this work the researchers draw up the tactical (operational) plan for the exercise (maneuvers). The researchers write up this plan as if for their own purposes. This is a sort of rough draft for the preparation of initial data.

This work can never be neglected. The fact is that if the theme of the exercise and the theoretical problems to be checked are determined as a result of the formulation of the theme for military science work, such problems as the determination of requirements on the exercise area, the duration of the exercise, the makeup of the forces used, the material supplies needed for the exercise, the number of motor vehicles and other forms of equipment can be determined when the operations of forces and staffs in the exercise are planned in general form. This in turn can be done only on the basis of formulating a plan for the exercise. At the same time, one should take care against an unjustifiable strictness in planning by use of troops and the expenditure of various kinds of material items.

These initial data will constitute a sort of application for a special exercise. For a more thorough analysis of the initial data by a higher commander it is desirable that they be supplemented by an exercise plan. Then this material must be presented to the senior commander who will give permission for it.

Upon obtaining permission for conducting a particular exercise the work on its organization begins. This work includes a great many problems and requires from its directors a high degree of theoretical preparation and practical skills in preparing and conducting exercises.

The director of the exercise is usually the senior commander of those units which will be involved in the exercise. It is usually undesirable to designate the researcher as director of the exercise unless he is senior commander of these forces because in a short time he will be unable to study the degree of training of the troops and officers and does not have his own

staff from which a command staff must be created. He also meets with great difficulties in solving problems involved in the material technical support for the exercises. Moreover, when the exercise director is not the researcher himself, a greater objectivity in the practical checking of the principles will be ensured. The fact is that it is always necessary to take into account the significant danger of the researcher introducting (against his wishes) subjective considerations in the exercise, that is, attempts to obtain results from the study which would confirm the theoretical principles which he has advanced.

However, this must not in any way lead to a diminishing and especially an infringement of the rights and the role of researchers during both the organization and the conduct of an exercise. They must take a direct part in formulating the intention and plan for the exercise, in preparing organizational instructions and tactical missions and in preparations of the umpire system, troops, staffs and the exercise area. During the course of the exercises they will participate in formulating various commitments, doing so on the basis of the decisions of commanders and the operations of forces, thereby bringing about the purposefulness of the exercise and ensuring the creation of conditions coming closest to actual combat conditions.

As already mentioned above, for participation in this work and for collecting materials and processing the exercise results it is customary to form a special group of officers and generals.

The head of this group must be the assistant director of the exercise. All problems on the organization and conduct of the exercise must be solved by [illegible] between the exercise director and his assistant.

The other members of the group will work jointly with the assistants of the exercise for different branches of the army, special forces and sources, will be included in the critique group and also collect materials from the exercise, observing the actions of the troops, commanders and staff.

It is usually undesirable that the members of this group be designated as umpires because an umpire must at all times be located near a particular responsible individual or in some particular section of the staff. This considerably reduces the opportunity for collection of materials from the exercise. For example, if an officer is in a regiment, but is not an umpire,

after assigning the regimental commander the mission to undertake a march he can go out to the subunits for observing their preparations for the march and then can observe the execution of the march. At a certain time, when it is necessary to observe the work of the regimental commander, this officer returns to the column where the commander is located. If the officer had been designated an observer of the regimental commander he could not have visited the subunits because he would have been obligated to remain constantly at the side of the regimental commander and evaluate his work.

The distribution of tasks during the exercise among the members of the group should be done prior to departure for the field forces for the purpose of preparing the exercise. This enables them to make preparations in an appropriate way for the execution of the missions assigned them.

In solving the problem of the deployment of participants in the exercise it must be taken into account that all members of the group must participate in the preparation of all the basic materials and that during the course of the exercise there must be assurance of their collection of materials and personal observation of the most important aspects of operations by the troops.

The members of the group participating in the preparation of the materials for the exercise, in collaboration with the director and staff, must ensure the creation of conditions making it possible to check the particular theoretical principles under conditions coming as close as possible to real combat conditions. In no case is it admissible to introduce any type of simplifications which favor obtaining results confirming the theoretical principles advanced by the researcher. For example, if the rates of movement of troops on the march in the direction of an increase in these rates are being checked it is inadmissible that the roots of movement of units and subunits be selected exclusively to pass along paved roads. In this case it is necessary that the troops make marches along both dirt and country roads and cross country.

Before beginning work on the organization of the exercise the officers and generals of the command staff must without fail be told of the objectives and missions of the exercise and the basic content of the research results which will be used as the basis for the exercise materials being prepared. In most cases it is desirable that the basic point of the research results be communicated by the presentation of a number of lectures and also by the

personal study of the materials in the military science study by the officers and generals.

This same preliminary theoretical preparation must also be conducted with the group of umpires and with the officer personnel of the troops participating in the exercise. This will enable them to mobilize themselves in an appropriate way for bringing about the formulated objectives and working purposefully in preparations for the exercise and during the course of its conduct. This important work is a direct obligation of the exercise director and members of the group.

When conducting tactical exercises and maneuvers their results are dependent to a considerable degree on the quality of training of the troops for this purpose. Accordingly, the matter of instructing the troops must be given the most careful attention. However, this should have nothing in common with special coaching of the units and subunits for the forthcoming exercise, such as the repeated working out of the problems which will arise directly in the area where the exercises are conducted.

As is well known, one of the negative aspects of use of materials from exercises for the development of military theory is that the exercises are conducted without a real enemy. For this reason the value of the results of exercises is dependent to a large degree on the extent to which the operations of the forces can be approximated to real combat conditions. Both the members of the group and the director and umpires must direct their attention to attaining this goal. Slackness and oversimplification must never be allowed in the course of an exercise. The exercise area must be unfamiliar for the troops. Conditions must be created so there will be opposition by a strong, technically well-equipped enemy. The creation of conditions approximating combat conditions will also be favored when there is a two-sided conduct of the exercise for checking the operations of one of the sides in relation to the tactics of a probable opponent. In this case there must be preparation of troops ahead of time and if necessary an appropriate organization must be created for them.

All the troops participating in the exercise must be familiar in general with the objectives of the exercise and must understand the great importance of the exercise for increasing the defense capacity of the country; in this connection it is necessary to mobilize soldiers, sergeants and officers for

execution of their tasks with a full output of their moral and physical strength.

Political work is of exceptionally great importance in solving this important problem. Its content, forms and methods are dependent on specific conditions. However, in all cases it must be conducted continuously, at a high ideological-organizational level and in close relation to the missions performed by the troops.

Political work must bring about the development of initiative, resourcefulness and boldness among the troops, combat coordination of units and subunits, proper use of weapons and military equipment, a high military discipline, steadfastness in bearing all the burdens and deprivations of the conditions accompanying the exercise, display of the qualities of Communists and Young Communists in the exercise, indoctrination of officers and generals in the spirit of uncompromising struggle against the elements of any type of slackness and simplification, as well as a display of concern for the satisfaction of the material, personal and cultural needs of all personnel during the exercise.

During the exercises all the decisions and orders of commanders, work of the staffs and operations of the forces must be carefully recorded. It is desirable that opinions on the exercise and proposals be collected from the troops participating in the exercise.

The methods for work by the members of the group will be similar for the most part to the collection of materials by researchers participating in other military exercises.

In processing and analyzing the materials from exercises, which will be made fully available to the members of the group, it is necessary to adhere to the fundamental principles of scientific work.

In this analysis one must not overlook the negative aspects, particularly if they contradict the theoretical principles advanced by the researcher; it is necessary to point out what requires additional checking and doubtful conclusions must be noted.

Tests of various new kinds of weapons and military equipment in the army and at proving grounds can check a considerable part of the conclusions drawn

by a researcher who has written a study in military theory in which he proposes tactical and technical requirements on weapons and military equipment and on their use in combat. Accordingly, the participation of the researcher in these tests must be considered extremely desirable.

In another case, the researcher in the development of new kinds of weapons and military equipment can participate in determining the tactical and technical requirements on them and their use in combat. After manufacture of experimental samples and performance of factory tests he participates in the formulation of a program for tests in the army and at proving grounds. These tests are a practical check on the correctness on the proposals made on these matters.

The program for the tests must ensure the testing of some sample of weapon for combat equipment under conditions coming as close as possible to combat conditions, in various types of terrain and under various climatic conditions. In this procedure the researcher who has developed the tactical side of the program concentrates his main attention on ensuring that the tests will be conducted under conditions coming as close as possible to real combat conditions.

Observations of the tests, collection of data and summarization of the results will be performed by the researcher in large part in the same way as was described with respect to army and special exercises.

12. Preparation of Plan or Prospectus of Work

The plan or prospectus for work is usually written up after the material has been collected and it is only necessary that the results be set forth in written form. The preparation of a plan or prospectus essentially completes the first cycle in the scientific research, including the most important stages of the latter. These stages are followed by the stage of writing the text of the scientific study and its preparation for publication. During preparation of the prospectus it becomes clear to the author himself how completely and carefully the material was collected and analyzed and how solid a foundation he has laid for the basis of his research.

This plan or prospectus differs from the working plan in that instead of the problems which must be investigated (or abstract nouns in the form of a table of contents), it now contains concise solutions to these problems. Since

the collection of the material and the scientific development of the theme were based on the working plan, the plan or prospectus now being discussed is prepared by refining and incorporation of greater detail into the working plan: the headings and the content of the sections as well as the sequence of exposition are refined, the place for diagrams, tables, figures, etc., is determined, a concise content of the chapters, sections and subsections is included, their probable length and the planned time allocated for their writing is indicated.

It is difficult to give recommendations on how to write up such a plan or prospectus of the great variety of subjects dealt with in military art and the differences in creative capacities of individuals, their experience in military science work, individual skills and habits, etc. It is entirely obvious that every author always prepares for each of his studies a unique and unrepetitive plan or prospectus.

However, we can point out the fundamental elements of such a plan or prospectus. In most cases they are mandatory in the preparation of any operational-tactical theme and can be arranged in a definite sequence and order. These elements are: introduction, historical review, fundamental part of research and general conclusions.

The introduction or forward usually contains: 1) explanation of the timeliness of the topic; 2) exposition of the purpose of the study; 3) an exposition of the research method used by the author. The author usually declares who his advisors were during the selection of the particular topic, the place it occupies among the general problems in military art and what theoretical and practical importance the solution of this problem has for military science as a whole or for its individual branches.

After the introduction it is desirable to give a historical review setting forth the basic stages in the development of the investigated problem and the present-day status of its theoretical development. Emphasis must be devoted to an analysis of the experience in the First and especially the Second World Wars and the tendencies in the development of the investigated phenomenon noted during the course of these wars. It is also useful to give a concise critical review of the literature and sources on the particular theme, particularly pointing out those which provided something substantially new for the solution of the investigated problem. It is desirable that this

section end with a clear exposition of the problems remaining unsolved in this field to which (in whole or in part) the particular study is devoted.

The historical review makes it possible to define definite laws and principles in the methods for waging different kinds of combat operations, the organization of troops, their training, etc. If well done, such a review in combination with the conclusions necessary for further research can become a highly valuable part of the entire study. Unfortunately, this part of the plan or prospectus in many cases is neglected by military researchers and accordingly does not find a place in studies in the field of military science.

The next point in the preparation of such a plan or prospectus is the exposition of the theme. This is the fundamental and central part of the plan or prospectus and the research itself. This part must be developed as fully and carefully as possible. In this part a definite scientific result must be attained, new principles and recommendations, etc., must be validated; this naturally must be reflected in this part of the plan or prospectus.

Finally, the last section gives the general conclusions for the topic as a whole. It goes without saying that it still is not always possible to formulate such conclusions fully in the plan or prospectus, but it is necessary to indicate roughly on what problems and in what direction conclusions will be drawn. However, if the conclusions which are to be drawn in the study are known to the author, at least in general outlines, it is desirable that they be given in the plan or prospectus.

The existence of such a plan or prospectus ensures good sequence in exposition and a clear and logical development of the study. Every detail occupies its proper place and follows from the preceding text. However, if no such plan exists, everything is scattered and there will inevitably be a lack of balance in different parts of the study, gaps and omissions, and at the same time repetitions and cluttering. Lack of a plan and lack of a system in exposition result in the author's abuse of such expressions as: "it has already been stated (or demonstrated) above", "as has already been noted", "we will again return to this problem", "as will be demonstrated", "this will be demonstrated below", "I repeat", etc.

This plan or prospectus, like the working plan, must be subjected to group discussion.

It goes without saying that the preparation of this plan or prospectus must not narrow the framework of further creative work by the author. The initiative and creative capacities of the author are fully manifested only during the writing of the study.

Footnotes

1. Here, as in the exposition which follows, we will use the word "book" for any source in the literature.

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Chapter VI

LITERARY FINALIZATION OF A SCIENTIFIC STUDY

1. Researcher's Direct Preparations for Writing the Study

Work usually begins on the literary finalization of a study in military science after summarization of the research results and conducting the necessary experiments, that is, after the research has been essentially completed, definite conclusions have been drawn, a plan or prospectus of the military science study has been prepared and the only remaining stage is putting the results down on paper. However, despite the great amount of preliminary work, the literaty finalization cannot be regarded s a technical process. This process is profoundly creative and during its course the conclusions which have been drawn can be refined, developed and enriched with new ideas.

Moreover, during the course of literary finalization the need can arise for conducting additional research on a number of problems. Literary finalization in a definite sense summarizes the results of the research and makes its findings clear and graphic, comprehensible for a wide variety of military workers.

The literary finalization of a study in military science must be directly preceded by a review of all the accumulated material and a review of all the notes which were made. This makes it possible for the materials presented in the form of cards, notes, tables, drawings and diagrams to be put into systematic form, classified and arranged in a definite sequence on the basis of the already refined plan or prospectus for the work and assists in the most complete visualization of the future study and aids in devising the system and sequence for exposition of the material.

This preliminary work affords the author the opportunity of avoiding unnecessary repetitions and determining in advance the importance of each of the sections in the study and their compatibility in length with the total volume in such a way as to concentrate his thoughts on those aspects of the study which must be set forth as clearly as possible, and finally and most importantly, it safeguards him against going astray from his planned objective during the course of writing the study.

In writing major studies in military theory, in proceeeding to the writing of the next chapter (section), despite the work done earlier, it is

desirable to examine and read through the material selected for this chapter still another time.

It is very difficult to write. The writing of an article or book on any problem in military theory requires a tremendous will power, perseverance and patience. The classical writers of Marxism give a clear example of such work. F. Engels was exceptionally productive in his writing. For example, in making preparations for the publication of the second volume of "Das Kapital", he daily completed about a half-sheet or a little less [1]. In a letter to a common friend on the methods used by Engels in his work, Marks wrote: "He is a real encyclopedia. He is capable of working at any hour of the day or night, after eating or on an empty stomach, he writes rapidly and sharply, like a streak" [2].

The great master of the artistic word, A. N. Tolstoy, in his address entitled "To Young Writers", wrote: "The experience of each of us indicates: the process of writing is a process of overcoming. To overcome material is to overcome yourself. The writing process is always impeded by obstacles across which you must make your way. It is always difficult for you. There was never anyone who found it easy to write, for whom 'words flowed from the pen'. It is always difficult to write and it is all the more difficult the better the product". In this address he also notes that "the obstacle should not be overcome through boredom, but the author should fly over it with wings" [3].

Constant training is required in order to write reliably and thoughtfully. Long interruptions in the work have the worst effect on the creative process when presenting material. Stubborn and systematic work on the writing of a scientific study is a completely necessary condition for its successful completion. Every day at least a small amount of time must be allocated for writing the study. In addition, it is very important to write at the same hours, in no case shifting the work to some other time, and especially not allowing interruptions in the work, since this can have a negative effect on the quality of the work. The fact is that this requirement has a physiological basis. Our body is constructed in such a way that it can adapt to a way of life even within the confines of a 24-hour period.

As demonstrated by the experience of many scientists and writers, it is best to write in the morning. In the morning a person is most vigorous and

capable of work, his mind is fresh and receptive, his mind is not yet burdened with commonplace details and events in his daily life, which undoubtedly have a certain importance but do not facilitate the creative process.

However, such a recommendation, despite all its merits, unfortunately cannot be followed by all researchers. The conditions for work for many researchers do not allow this course of action. However, in this case as well, the researcher should set definite working hours for himself, such as in the evening, and possibly on days off. In making use of such hours it is very important to allow oneself at least a short rest before proceeding to literary activity in order to shake off the events of the working day.

The literary finalization requires a great amount of concentration and intense application of the author's mind. Dostoyevskiy expressed this concentration of thought during literary writing in the following way: "When I write something, I think about it even when I dine and when I swim and when I am talking with someone". In the case of a major study this concentration of energies must be maintained over a long time. Therefore, authors and groups of authors must not break off their work on a particular topic for a long time unless necessity dictates, particularly when they have undertaken the literary finalization of the material.

The ability to write is a purely individual quality and therefore one cannot give any specific recommendations which if studied would enable one to sit down and write a scientific study on a particular topic. Acquired knowledge and gradual accumulation of skills and methods in presenting material assist the author in avoiding serious mistakes when writing a study and safeguards him from unproductive waste of time.

2. Methods and Sequence for the Exposition of Material

The methods for exposition of material are highly varied. They are determined by the degree of preparation of the author, his skills in literary work, his frame of mind and nature. Accordingly, there are many individual aspects in methods for exposition of material which are individual for each particular author. However, despite all this, the methods of exposition for almost all authors can be classified in definite groups on the basis of external, but very important criteria, if on no other basis.

Some authors think out their entire study to the smallest detail, mentally visualizing it in their heads in the form in which it should appear when already reduced to paper; then they write it down quickly in final form without corrections and rewriting. V. I. Lenin had this manner of writing. Many other classical writers, such as Goncharov, Bickens and others also wrote in this way. This method requires very great concentration and original memory, as well as great skills in literary work.

When this type of writing is employed one can make successful use of dictation of the material directly to a typist. The method of dictation of scientific material to a typist was frequently used by Colonel-General of Military V. D. Grendal', working at the Military Academy Imeni N. V. Frunze. It should be noted that this method requires an enormous memory and a strong imagination and cannot be used by everyone. Even many great writers and scientists cannot use this method in writing their studies.

The dictation method is characterized by a very great productivity. As shown by the work experience of some scientists and writers, a printer's page can be dictated in one or two hours. Under the condition, naturally, that the author is well prepared, he can collect his cards, clippings and diagrams, lay them out in a definite order and think out the sequence of exposition. In this case it is also possible to use the stenographic recording method with success, as well as modern sound-recording instruments, that is, tape recorders.

It is no easy matter to write with the aid of a stenographer or use a tape recorder for this purpose. One must have experience and the capacity for rapid exposition of his thoughts. However, whoever has this capacity can use this writing method very advantageously. Certainly, the work done by this method will be far from perfection. There will be repetitions, excess words, or possibly some points which have been presented too briefly and which would be difficult to understand in a printed text. Moreover, the stenographer may allow certain omissions, misprints and even distortions of individual thoughts. Accordingly, the stenographer's record must be carefully edited and corrected and the matters which were omitted must be supplied.

Some scientists and writers use several writing methods. First they present all the material without careful refinement and working over what they have written, and then in the process of subsequent, sometimes repeated

rewriting, they bring the material up to the necessary quality. In his autobiography Darwin wrote that first he had the custom of thinking out sentences before he wrote them; however, several years later he found that time would be saved if he rapidly wrote down entire pages as quickly as possible, abbreviating his words by half, and then correcting them. In this case the writer pays no heed as to whether he has found the appropriate word, apt expression or well-turned phrase. It is important to be able to write down a flood of unessential thoughts very rapidly, especially when the creative process is on the rise and the author is experiencing creative inspiration.

The rate of writing can be very different. Some find the necessary phrases with difficulty, frequently correct and cross out what they have written, refer to notes and memoranda, think out every thought and only then put it down on paper. In this case the study is produced, if it can be so expressed, "in the torment of creativity". Others, thinking through what they intend to write, write rapidly and without interruption; phrase after phrase flows from their pens.

This method can prove to be difficult for new scientific workers. Accordingly, at the beginning of scientific work it is better to do work on literary finalization in the following sequence: select all the necessary auxiliary materials, arrange them by sections and chapters of the study in accordance with the plan or prospectus, and then, after working out a detailed plan for the section (chapter), first write a rough draft of these sections, and then carefully finalize each section (chapter) separately, first showing his drafts to a more experienced comrade.

In stylistic respects an effort must be made to bring the manuscript into good form from the very beginning. It is necessary to think out phrases clearly and only then write them down. However, this does not at all mean that later no additional work will be required on them. Even the greatest writers, before sending their products for publication, rework them several times. For example, L. N. Tolstoy reworked some of his writings 15 or 20 times.

It is better to begin with the first chapter and then successively proceed with the writing of the entire study. However, as experience shows,

this is not always possible. Materials can be lacking for some chapters (sections) or serious difficulties can be encountered in the exposition of individual matters and much effort is required for overcoming these difficulties. In both the first and second cases, in order not to lose time, it is desirable to proceed to those chapters (sections) which can be easily written and later return to the others. By this time the lacking materials may have been acquired and more thought will have been given to those matters whose exposition had caused considerable difficulties.

Without having experience, workers in military science frequently begin to write their studies with an introduction. They spend a great amount of time on this and when the entire study has been written they conclude that it is unsuitable. It is desirable that the introduction be written after the entire study has been written because in a concise and abbreviated form it must convey to the reader the theme of the study and provide a brief summarization of the structure and content of the book. However, in discussing this, it should be noted that there are a number of extremely mature authors who prefer to begin their work with the writing of an introduction. They feel that this should be done because with this method they immediately show in a very concise form the content of the future study which is then developed. However, as experience has shown, even these authors, after writing the entire study, must thoroughly rework the introduction which has already been written.

Some workers in military science first draft a concise abstract or summary which sets forth the fundamental thoughts of the future study. Then, with one or more drafts, these thoughts are considerably deepended and broadened and finally the initial draft is transformed into a brochure or book. This method of exposition can also be successfully used by new authors. It is the indisputable advantage that it enables the author to see his entire study, at least in a very concise and abbreviated form, and correctly determine its general direction, refine the scope and see shortcomings in composition.

Two methods of work by an author stand out clearly in literary finalization: constructive-synthetic and critical-

The constructive-synthetic work method is manifested primarily in the formulation of the thoughts arising in the consciousness.

The critical-analytical work method is manifested in a profound analysis of the thoughts which appear, in the elimination of some thoughts and in the reproduction of others which are clearer and bolder.

As work experience has shown, at the beginning of writing it makes sense to give sole freedom to the first method in order to be able to write down the entire flood of unessential thoughts without fearing that an inapt word will be used or that some phrase will not be entirely smooth. Otherwise, the writing process will transpire very slowly and as a result there will inevitably occur a creative failure.

The constructive-synthetic method exceeds the critical-analytical method in its intensity and stress, but this by no means suggests that it can be given preference in all cases. As soon as a first draft of a chapter or section has been made and the author proceeds to its finalization, the critical-analytical method comes to the forefront; this enables the author to cast aside everything which is excessive and unnecessary, include new thoughts and polish those thoughts which have not been entirely successfully presented or which sound unconvincing.

During writing the author must not strive to put into the study everything which he has collected. It is necessary to select only that which is basic and important, avoiding unnecessary details. In the exposition of material one must not use abstract reasonings as a point of departure; instead the author should make use of events and facts which are familiar to the reader and which excite him. Gradually and in a definite sequence the author then shows the relationship between these facts and the investigated matters. Facts well known to the reader need not be described; only a reference to them is required. Facts which have not yet been published or which are little known to the reader must be presented in a fuller form. However, even in the latter case the exposition of a fact or example must not overburden the text and distract the reader from the main idea. In the exposition of a number of facts only the necessary ones should be presented and in each of them the same aspects should be noted and in the same sequence.

The scientific value of a study is dependent to a large degree on how correctly the author is able to define the problems most important for his particular theme, analyze what is essential in their content, show the

internal relationship of phenomena and their interrelationship with other phenomena and clearly and sharply set forth his thoughts. A scientific study must contain in the text a clear discrimination between the main thought and the arguments, between the initial points and conclusions, and it must be systematically arranged and comprehensible.

Some young authors strive to squeeze everything which they have collected into their study, in this way hoping to create a favorable impression on their associates by the length of their study. However, this is a serious blunder, such a study will be read with difficulty and what is truly important will be hidden in this study by secondary and sometimes unnecessary details. As a result, the study does not achieve its set objective and an experienced reviewer will never approve it.

Later the shortening of the study will require great additional efforts on the part of the author and editor. Everything which is superfluous will have to be excluded from the study. As is well known, the shortening of a study is by no means a simple matter. The author usually resists any shortening of what he has written and the editor sometimes can shorten what should not be shortened. Accordingly, from the very beginning of writing his study the author must bear in mind the limitations on the length of his study so that by selecting what is most important and essential it will fit within the allocated limits.

It must always be remembered that the scientific value of a study is determined by content and not by volume. In his "Aprel'skiye Tezisy" (April Theses) V. I. Lenin set forth the problems of the proletariat during the transition period from the bourgeois revolution to the socialistic revolution on less than five pages; Charles Darwin expounded his entire theory of evolution on four pages; Albert Einstein presented his theory of relativity on two pages; D. I. Mendeleyev presented his entire periodic system of elements in a single table.

However, these are highly important discoveries making an enormous contribution to science, whereas many studies containing hundreds of pages have been of no value whatsoever.

The obective of literary finalization of a study is primarily its communication to a great number of readers. Accordingly, in beginning to write, the

author must think primarily of the reader and present the material in such a way that it will be entirely readable and comprehensible to the reader. This is particularly necessary when writing textbooks, study aids, journal articles and brochures in the popular science field.

In writing his study the author inevitably finds it necessary to borrow the thoughts of others which have been presented in various sources. It is impossible to ignore the thoughts of other authors published in studies written at an earlier date. They must be used. Indeed, it is very difficult to find a study in which all the matters considered are new and not a single earlier published thought appears. This is entirely natural. No study is written "from scratch". It reflects and brings to the foreground the experience of earlier generations.

All this indicates that the thoughts of others can be used, but this must be done for a purpose. Moreover, it is necessary to distinguish clearly the thoughts of the book's author and the thoughts of others which he has employed. References must be made to the sources from which these thoughts were taken.

However, it must be remembered that in some cases the author, in using the thoughts of others, reworks and develops it critically to such an extent that it becomes completely dissimilar to the earlier thought in both form and content. Naturally, in such cases no reference to the literature was mandatory nor should it be given; a mention of the source in the list of literature used will suffice.

Many authors, in taking thoughts from other sources, fail to cite references. As a result, in reading such studies it is difficult to determine which thoughts are new with the author and which ones have been taken from other sources. It only becomes clear that this study was made with the extensive use of the thoughts of others because the great variety and unevenness of style is clearly noted.

In many cases during the exposition of material it is necessary to make references to the literature for confirming or illustrating the thoughts which the author has expressed.

References must not be abused. When the study is strewn with references, the reader can form an unfavorable impression concerning the author, that he

is a person capable only of compiling the thoughts of others and is incapable or unwilling to analyze critically the material which he presents.

Accordingly, before giving references it must be clear what is of an original nature in the cited material and whether the reference is convincing.

The reader gains a particularly unfavorable impression from the abuse of "self-citing", that is, when the author makes reference to his own earlier published studies, sometimes of an extremely mediocre nature.

In order to avoid a great number of references, particularly in studies of military history, combat and report documents which are of value only as secondary material should preferably be included in an appendix, with the text giving only references to them.

References must be made to primary sources, in no case allowing distortions of the bibliographic data.

It is characteristic for the scientific exposition of material that in it every point which is advanced by the author must be convincingly substantiated and demonstrated and the material must be presented in a strict sequence so that one point which is presented will inevitably follow from the preceding one. As is well known, this is a matter primarily of proper composition of a study in the broad and narrow sense of this word.

In the broad sense, by the word "composition" we mean the proper structure of the study, a definite sequence in the arrangement of chapters and sections and their proper proportion. In the narrow sense the word "composition" means the sequence of arrangement of the author's thoughts within each section and subsection and even paragraph. Only the proper composition structure of thoughts ensures a logically continuous and rigorously scientific exposition.

In contrast to the composition of parts of a book, the composition of thoughts is a very complex matter and requires stubborn work in addition to definite skills.

The successful composition of thoughts is possible only if the author has thoroughly mastered his material and clearly visualizes the guiding idea of the entire study which should pass through everything he writes like a golden thread. Only the presence of a guiding idea enable the author to put every thought and every new point in its proper position.

In the exposition of material an author cannot jump from one thought to another. One thought must be ended and there must be a transition to a new thought, arranging them in a definite logical sequence so that all parts of the book will be interrelated and will follow one after the other.

Some authors, in striving to give their study a logical continuity, frequently replace the guiding idea by connecting expressions, thereby committing a very serious error. In proceeding from one part of the exposition to another they usually write: "Having examined this matter, we will proceed to the next". Such unnecessary phrases, as well as introductory words, should be avoided and replaced with a well-structured exposition of the material, which will speak for itself. The exposition of material should be such that the reader's thoughts at all times are carried forward, guessing the subsequent course of exposition.

In striving to make their presented points convincing, some young authors sometimes go to the other extreme. They begin to substantiate and demonstrate points which were demonstrated long ago and recorded in regulations and instructions or in other studies. It is entirely obvious that this makes the study uninteresting and repels the reader.

When writing a study serious attention must be given not only to the content of the presented materials, but also to their form of exposition. The form of exposition must be convincing, simple, comprehensible, and at the same time quite modest. In studies the authors should avoid references to themselves and also not use expressions which unfortunately are still encountered frequently in our literature, such as "in the author's opinion", "the author assumes", etc. The word "we", when it refers to the author himself, is also unseemly. Even more unacceptable is the use of expressions which have the ring of self-praise, such as: "as we have already demonstrated", "as will be demonstrated repeatedly", "our experiment irrefutably indicates", etc. The general tone of the statements must be modest and not based on the author's personal assertions, but on the nature of the proofs and their logical sequence.

It is also necessary to adhere to a certain modesty in writing the titles of the study, individual chapters and sections. The title must indicate the content and communicate the most important attainments in the work and insofar as possible not narrow or broaden the framework within which the content fits.

It is irritating to see unwieldy and sensational titles in mediocre and insignificant studies of modest content and with a poorly structured exposition.

3. Requirements on Language and Style

Language is a means for expressing thoughts and the most important means for human communication. The written language expresses the life of a thought which is transmitted from mouth to mouth, from generation to generation. A. N. Tolstoy, in delivering an address at the First All-Union Congress of Writers, gave the following description of language: "Language is the choice of the gigantic productivity of labor of human society. It represents the deposited crystals of myriads of work movements, gestures and spiritual energy caused by them. All the complex movements generated in the depths of our being assume form in the expression of language. Language is the tool of thought. As one deals with the language so one also thinks: if one uses the language inexactly, one thinks only approximately and incorrectly" [4].

Without mastering a complex and highly varied technique of language, one can scarcely learn to write properly. Without knowing how to hold an ax in the hand a tree cannot be chopped down and without knowing the language well, beautifully, simply and intelligibly, one cannot write successfully. Anyone who thinks clearly expresses his thoughts clearly.

The author reflects his mental outlook and general development in his style of exposition. The reason for a garbled, confused exposition must be sought primarily in the author's confusion of thought and his poor knowledge of the subject on which he is writing.

Our Party has always devoted much attention to the language of the Bolshevist press. In a decree of the Central Committee of the All-Union Communist Party published in October 1936, it was stated: "Write concisely and boldly, with simple and comprehensible language. Mercilessly eject long ramblings and confused sentences. Explain and interpret all necessary foreign words and terms. Write precisely, specifically and in a popular style, without unclear and distracting twists and turns and word building, but without recourse to false simplification and harmful vulgarization. Eliminate trite and banal expressions. Achieve a vigorous, exemplary, attractive, lively form of exposition without allowing pretentiousness and pomposity" [5].

This requirement of the Central Committee fully applies to the language in military studies which unfortunately are still by no means perfect in language respects, being characterized by a great dryness of exposition.

In studies in military science, like in other scientific works, language is a means for expressing concepts and presenting proofs of the presented points. This imposes on the language such completely obvious requirements as accuracy, clarity, literary style, brevity, revolutionary ardor and a popular and comprehensible style. Moreover, the language of military studies must be lively and literate.

Accuracy of language in military science studies is particularly necessary. Without this it is difficult to expound the presented points correctly and avoid a double meaning, which usually arises due to an incorrect construction of phrases or poor selection of words. In order for the language in military studies to be precise it is necessary to present the material correctly, without logical contradictions, and use the terminology employed in the military literature.

A double meaning can arise due to underdevelopment of a thought in a sentence, due to a poor use of a phraseological expression, the improper use of syntactic connections, inapt combinations of words and other factors. In order to avoid this the author must thoroughly think out each sentence and analyze every word, which in actuality also makes it possible for a thought to assume real form, become tangible and be comprehensible for the reader.

The proper use of scientific and military terminology makes it unnecessary to use superfluous explanations in the study and makes it understandable to the reader. As is well known, terminology is not unchanging; it changes as time passes and becomes refined, and therefore in theoretical studies one must use the most modern terminology corresponding to generally accepted concepts, as well as adhering to a uniformity of terms during the entire presentation.

When writing studies in military history and using historical documents in the text one can encounter outdated terminology which no longer corresponds to present-day concepts. In this case, as well as when introducing new terms, explanations must be given.

The clarity of language is determined primarily by the clarity of thought. The clearer the thought, the clearer, simpler and more accessible will be the author's language. In order to describe a military phenomenon (subject) clearly and distinctly there must be a thorough and profound understanding of its nature and penetration into the heart of its content. At the same time, it is undoubtedly necessary to have a knowledge of the language, an extensive vocabulary in which all our reasonings and concepts are embodied. A large vocabulary is a necessary condition for good style.

Clarity of language is the fundamental requirement in any study. Accordingly, the author must strive to write so that what he has written will be comprehensible to everyone who reads it, so that it cannot be misunderstood, so that the reader will visualize the phenomena expressed in words as actually transpiring before his eyes and so that the thought presented on paper will reach the reader's very soul. This requires that the author avoid complex phrases, words which are unfamiliar, meaningless and banal expressions which make the text ugly and repel the reader. In discussing the use of unfamiliar words, L. N. Tolstoy, in one of his letters, wrote: "If I was Tsar, I would issue a law that a writer who uses a word whose meaning he cannot explain would be deprived of the right to write and receive a hundred blows with a birch rod" [6].

Foreign words also have a negative effect on the clarity of language and its accessibility for a wide number of readers. Accordingly, insofar as possible an effort should be made to avoid the use of foreign words and particularly they should not be used except when essential.

V. I. Lenin waged a merciless struggle for the purity of the Russian language, against its contamination by foreign words. In his brief communication entitled "On the Purification of the Russian Language" he wrote: "We are ruining the Russian language. We use foreign words without necessity. We use them incorrectly. Why should one use the word 'defects' (the Russian cognate of the English word) when one can use the (Russian words) inadequacies or shortcomings or gaps? . . . Has the time not come for declaring war on the torturing of the Russian language?" [7]. The military researcher must bear these instructions of V. I. Lenin in mind and conduct a struggle for the purity of the Russian language in his studies.

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While resolutely struggling against a contamination of the Russian language by foreign words, it must be taken into account that it is not always possible to avoid the use of foreign words completely. Many foreign words, due to their international significance, are rapidly incorporated into the dictionary, and some become commonplace in the spoken language. Such words must be used in relation to the level of training of the reader and in necessary cases explanations of foreign words must be given.

In addition to explaining foreign words, V. I. Lenin also found it necessary to explain newly formed words (neologisms); it might be noted that he used them very rarely and until they had been firmly established in our language and had received the "rights of citizenship" he enclosed them in quotation marks and in case of necessity explained their meaning in the text.

Despite the entirely obvious importance of clarity of the language, we still encounter many obscure and incomprehensible places in our military studies. In analyzing these studies it is easy to note the reasons which made it impossible for the author to write his study in readily comprehensible language.

In some studies this can be attributed primarily to the author's carelessness, the fact that he did not want or could not work on his style; in other cases it can be attributed to a poor education or background, the fact that he had the presumption of writing a study in a field in which he did not have a thorough knowledge, did not really master his material and wrote on something that in some cases he himself did not thoroughly analyze. Such difficulties very frequently arise for authors who receive the assignment of writing a study on a new topic and then proceed at once to the literary finalization without even undertaking the research process.

A lack of clarity in exposition can sometimes be attributed to the poor development of a new problem, when the proposed hypotheses and theories far outstrip the available factual data. In this case the lack of clarity in language arises primarily due to the unconvincing nature and unsubstantiated character of the points advanced by the author. Such inadequacies can be encountered in the writings of authors who grab at a fashionable topic and then cannot handle it.

Sometimes some authors are forced knowingly to not pursue their ideas to the logical ends. They do this in order to hide the details of the described method of military operations or an invention. This is usually done when interesting data are obtained and some of them must be published in the open press but some must not be published.

Finally, there are some studies published by authors who are time servers, who knowingly do not express their own opinion, retaining for themselves the right to interpret their thoughts as will be advantageous for their purposes. Such individuals usually do not have their own opinion on various problems and only echo well-known authorities and blindly, a little carefully, follow in their footsteps.

Language with a double meaning is used extensively by bourgeois authors, but in this case it is caused by class interests, the aspiration to hide the objectives of the bourgeoisie from the broad masses of the workers. In our country recourse to this procedure is taken by dishonest individuals who are not thinking of the advantages to science, but only their own interests.

The military researcher must strive for the greatest possible clarity in exposition. The exposition must be simple and comprehensible; this is his primary obligation. No recommendations can be given on how to present material clearly. Everything is dependent on the specific content of the subject. Authors must constantly bear in mind the problem of clarity in exposition and learn this primarily from the classics of Marxism-Leninism. F. [illegible] writing concerning the third volume of "Das Kapital", stated: "The clarity of exposition is such that direct disagreement with the author is all the more impossible. The most difficult points are clarified and intertwined with such ease as if it were child's play and the entire system acquires a new and simple form" [8].

However, it must be understood that clarity in exposition does not free the reader from the necessity of thinking, for penetrating into the meaning of what has been written. Sometimes the profound meaning of what has been written requires repeated reading.

Literary style in military science studies primarily involves an intelligent combination of our rich Russian language with military terminology. The Russian language is rich and highly varied, it can express any concept very clearly and distinctly, in a way comprehensible for everyone.

The Russian language has no equal with respect to its vocabulary, the variety of syntax, sonority and flexibility. All Russian authors have written about it with a noble feeling of national pride. The representatives of all literary schools and directions bow before the power and beauty of the Russian language. The classical writers of Marxism exclaimed with delight about the excellence of the Russian language.

The researcher's task is to make intelligent use of all the richness of this language without contaminating the text with unnecessary words and incorrect phrases. The author must have a large vocabulary and learn to use it properly. Then the author's words will pour out smoothly and continuously. The writings of the classical authors, explanatory dictionaries of the Russian language and various military dictionaries will be of great assistance to the author in this task. They will enable the author to enrich his vocabulary and will help him to find the words which can be used in clearly and comprehensibly expressing every thought.

V. I. Lenin enriched his language by constantly consulting dictionaries. He loved to use proverbs, sayings and words which were neat and to the point. He could sit for hours looking in dictionaries and various kinds of handbooks.

We now have a great many dictionaries which can assist the author. In addition to the Dal' dictionary, authors should consult the Ushakov, Ozhegov and other dictionaries.

The use of proverbs and sayings, as well as apt expressions, brings the style of the study closer to the living national speech and makes the study more readable. At the same time, for enlivening the written speech and giving it greater literary style in some cases it is very desirable to use the techniques of fine literature for comparing and explaining some thoughts.

The revolutionary ardor and popular style of language are very closely related to its literary style. The literary properties of the language make it possible to transmit not only the author's thoughts, but also his emotions, his ardor and his military spirit. Revolutionary ardor was always characteristic for the Bolshevist press in the struggle for implementing the policy of the Party. This ardor, as a basic feature of style, is graphically manifested in the writings of the founders of Marxism-Leninism. At the same time, leaders of our Party always spoke out against excessive use of garish and scathing language. The author's anger should be based on profound Party principles,

not on the desire to settle personal scores with his enemies. The popular style and simplicity of language are achieved by an intelligent selection of those words and syntactical constructions which are readily comprehended by the reader. The author must always strive to achieve a popular style in his language, but he must never go to the other extremity, brazenly explaining something which has been known for a long time and presenting this as a newly discovered truth. In the quest for a popular style it is also impossible to simplify the text and use popular words and expressions which do not explain but only obscure the content.

Brevity makes the language comprehensible and readable; it frees the language from excess wordage. Accordingly, it is no accident that many writers and scientists have repeatedly said that one must write in such a way that the words are few but the thoughts are ample. An excess of words makes the study tiresome and uninteresting and its meaning thin and unclear. It is difficult to grasp the content due to the excessive number of words. The use of an excess number of words usually is caused by the inability to establish a difference between two or more thoughts and find a distinct boundary between them and also because the author lacks the necessary stylistic skills. From the very beginning the scientific worker must strive to write briefly and constantly develop this quality in himself. It is not easy to write concisely; this requires much work on the improvement of style and the author must mercilessly expel from his writings everything which is superfluous, everything which does not improve but only obscures his thoughts. Only that which is fundamental must remain in a manuscript; it must not be overburdened by data not applicable to the subject and any possible repetitions must be avoided.

In the interests of brevity it is not always necessary to describe all the examples of combat which an author has collected; he needs to use from them only the basic data necessary for describing and supporting the points which he advances. Moreover, the number of cited examples must be limited, selecting only the most typical ones. Many facts from the experience of war and army exercises need not be described in theoretical studies; instead, they should be presented in the form of analyzed statistical data summarized in tables. Brevity in exposition can also be achieved by simplifying sentences.

While in every way making sure of brevity in exposition, the author must not go to the other extremity. As was already mentioned, brevity is a very

good thing but it sometimes can impoverish a study and narrow the author's range of thoughts. In creatively approaching the solution of a problem it is always necessary to retain a feeling of proportion. Sometimes excessive brevity in exposition forces the reader to spend far more time on comprehending what has been presented in a few words, clear for the author, but not clear for the reader. It is also necessary to take into account the circumstance that individual authors, hiding behind the requirement for brevity in exposition, write empty studies containing nothing but common slogans, in actuality presenting nothing at all concerning the content of the investigated topic.

A style which is easy to understand is achieved by making the content specific, by an apt presentation of the facts, clarity and sequence in exposition. A logical and convincing exposition, a popular style and simplicity of language help in achieving this.

A style which is easy to understand and expressiveness in exposition can not be achieved without using the graphic and expressive qualities of the language. When writing military studies it is possible to make successful use of metaphors, comparisons, inversions, etc., in accordance with the content and style of the study.

However, it must be remembered that a style which is easy to understand and expressivness of language has nothing in common with mere verbiage or with the quest for a "beautiful" style. True beauty in language is in simplicity, not in pretentious expressions.

A style which is easy to understand is influenced to a certain degree by the stylistic construction of the sentences. Long and complex sentences with a great number of punctuation marks are difficult to read. On the other hand, a study which contains sentences which are too short is also difficult to read. The sentences must be constructed in such a way that they will correctly reflect the thought and at the same time will be readable and sound well.

In the literary finalization of a study it is impossible to avoid stubborn and patient work on style. Brevity, clarity and expressiveness are achieved in the process of long and careful work.

Style is individual for each author. It does not come from birth, but is developed during the process of difficult work. History tells of many examples when writers and scientists in beginning their work did not have a

good style but achieved all the secrets of writing and became excellent stylists as a result of stubborn and careful work.

For example, the famed scientist Helmholtz in 1850, when he was 29 years old, wrote to the scientist Du Bois-Reymond a report on his discovery concerning the velocity of propagation of nerve excitation; he soon received an extremely unfavorable answer. Du Bois-Reymond wrote: "Your study, and I say this with pride and bitterness, is understood and appreciated here in Berlin only by myself. You presented the essence of your finding, and don't be offended, in such poor order and obscureness that your work can serve only as an aid in unraveling the research method" [9].

The young Helmholtz took the comments of his colleague in a critical way and began to work carefully on his style of exposition and later, as is well known, became a superb stylist. His articles and reports even to this day are considered classical in clarity and the beauty of their language.

4. Some Typical Shortcomings in Language and Style in Military Studies and Methods for Their Elimination

The language of many military studies is poor in graphic expressions, attractive turns of speech, and usually is dry and monotonous. A limited vocabulary is sensed in everything. Sometimes it is possible to find a rather extensive military study in which the author employs only a couple of hundred words; in such studies it is common to find stereotype expressions such as "must", "ought", numerous instructions and a mandatory and insistent tone. Each of these words and expressions is entirely acceptable, but when they are repeated several times on a single page it is difficult to read the study. Even such combinations of words as "front line", "breakthrough of the front", "on the defense front", "front commander" if encountered enough times, make the text difficult to read.

This can be attributed primarily to the earlier falsely indoctrinated laconicism of expression of thoughts by military men acquired in their system of education. The teachers of this "laconicism" did not understand that true laconic expressions, understandable and comprehensible to everyone, can be used only by persons having a large vocabulary and able to select those words which convey the essence of different phenomena most concisely but understandably. They have even reduced the concept of laconicism of language

to the requirement of using only commands or studied stereotyped expressions. The constant citing of regulations and documents, from which everything which can be legitimately eliminated has been removed, also trains military men in the constant use of a limited vocabulary.

All this imposes special obligations on the military researcher and requires from him a systematic and persistent work on broadening and deepening his vocabulary. In military literature it is necessary to avoid the language of regulations and "laconicism" caused by the poverty of the researcher's language. A dry and monotonous exposition fatigues the reader and he quickly loses interest in such literature. Naturally, it cannot be concluded from what we have said that a study in military science must be cluttered with unnecessary and superfluous words.

A poverty in vocabulary also arises due to an inability to exploit the tremendous wealth of the Russian language and due to the abuse by repetition of certain words and expressions such as: "who gives commands controls, who controls ensures . . . etc.". Each of these words and expressions is entirely acceptable but when they are repeated several times on the same page it is very difficult to read the study. Such a study produces a painful impression on the reader.

In order to avoid such repetitions, in the final preparation of the manuscript the author must find such words which will more precisely express his desired thought and at the same time will not repeat what has already been written. It is also possible to avoid repetitions by changing sentence structure or replacing some repeating words by synonyms.

The word "ensure", frequently used in the military literature, can be successfully replaced by the synonyms "achieve", "organize", "prepare", etc. However, synonyms must be used intelligently because synonyms are not identical, absolutely repetitive words, but only words close in meaning. Dictionaries of synonyms and the well-known Dal' dictionary, which explains words primarily by synonyms, are of great assistance to an author in selecting the necessary word.

In selecting the necessary words one must use caution against homonyms, that is, words which sound the same but have different meanings, which represent concepts unrelated to one another. For example, the (Russian) word

"kiyuch" can have several meanings at the same time: a spring, a key to a code or cipher, etc. It is easy to avoid homonyms, it is only necessary to think out each sentence carefully and if homonyms actually lead to a double meaning, replace them or explain in other words.

The abuse of abbreviations and their incorrect use gives an unfavorable impression.

In scientific work it is inadmissible to omit conjunctions and prepositions, as this is often done in military documents; this can be allowed only when there is an authentic presentation of some document. It is also necessary to give the declination for the name of populated places. Abbreviations of the type PPR, sd and st are inadmissible.

Abbreviations in scientific literature are admissible only for designated measures of length and weight, etc. However, in this case it is first necessary to use the established forms for the abbreviations and second, the author must adhere to uniformity during the entire study. Lists of such abbreviations can be found in special handbooks and manuals on typography, references which the scientific worker should consult frequently.

It is also necessary to adhere rigorously to uniformity in enumeration. For example, one author writes: "Cranial wounds were sustained by 5% of the first group, 7.5% of the second group and 9% of the third group of wounded". This sentence was incorrectly constructed. It should be written as follows: "Cranial wounds were sustained by 5% in the first group, 7.5% in the second group and 9% in the third group".

Augmentation must be avoided in the writing of quantitative indices and they should be written simply as: 5th, 8th, 26th.

Particular care must be given to agreement, especially in enumerations. Such errors are frequently encountered in agreement when the enumeration is given after generalizing words.

For example, one author, instead of repeating: "Among the positive properties of the infrared tracking method are as follows: complete secrecy and the impossibility of detecting the infrared light source; relatively great effective range; difficulty in camoflouging targets against the infrared sources", wrote: "Among the positive properties of the infrared tracking method are as follows: complete secrecy and the impossibility of detecting

the infrared source during operation; relatively great effective range; difficulty in camoflouging targets against the infrared tracking device". (Translator's note: The preceding paragraph is not readily understood in translation because the points given by the author pertain to complexities in the Russian language not evident in translation.)

In order to avoid this before beginning each new phrase one must recall the earlier one and make sure that the ending of the sentence agrees with it.

The correct arrangement of paragraphs is very important in a scientific study. Paragraphs divide the text into parts which convey a definite thought. If the paragraphing has been done correctly the text is easily read and readily comprehended by the reader. Excessively long paragraphs do not enable the reader to grasp the content rapidly, whereas short paragraphs distract his attention. Under normal conditions, a typewritten page of text should contain two or three paragraphs; however, this must be done intelligently, remembering that every paragraph must contain a definite thought.

The abuse of stock phrases gives a very unpleasant impression. For the most part the stock phrases are taken from regulations and instructions and they are encountered very frequently at the beginning of articles. The very same trite introductions can sometimes be found in two military articles which were written on different subjects. Such stock phrases are encountered most frequently in descriptions of atomic weapons or combat.

Some authors for some reason or another feel it their duty to first give a description of atomic weapons and then proceed to their real point. This should not be done. The editor can always strike out a trite, hackneyed expression, but if this is not done the book will lose much in the eyes of the reader.

Many scientific workers write very long phrases, add one subordinate clause on to another and get to the point with difficulty. It is very difficult to catch the content of such a phrase, particularly if it has also been poorly written.

For example, one author wrote the following clause: "The basic characteristics of fighter aircraft cover for troops on the defense can be: a large area of military operations and the great depth of basing of the units; more extensive possibilities of aircraft maneuvering along the front and in depth;

organization of interaction with fighter aircraft can be achieved with several larger groupings of troops in different variance of defensive operations; the need for developing several control posts for the different directions of operations of the forces of the operational group; shortage of manpower and equipment for antiaircraft defense in combined arms units; increased combat stress on crews of fighters".

This sentence contains more than 60 words. It is exceedingly difficult to comprehend it. The military researcher must avoid such sentences. It is not easy to write long sentences; they require a profound knowledge of the language and therefore new scientific workers should preferably write simple and short sentences.

Language and style are also dictated by the nature of the study. The style of a monograph and a journal article, much less a textbook, cannot be identical. A different style is even possible in a single scientific study. Theoretical presentations require a maximum of detail and a carefully sustained logic in constructing sentences. However, such a construction of sentences is not required when describing the course of combat operations. The author must always take this into account.

Proper punctuation is of great importance for properly conveying thoughts; unfortunately, this is not found in many manuscripts. This occurs primarily because the author reads his phrases as he feels they should be. He makes appropriate accents and pauses and the phrases sound correctly when spoken. However, when the editor begins to read these sentences, applying accent and pauses in accordance with the punctuation marks, a completely different impression is gained; sometimes the phrase acquires a different meaning. In order to avoid this the author should teach himself to apply accents and pauses where required by punctuation marks; then flaws in punctuation are rapidly detected.

It is true that shortcomings in the spelling of family names of foreign authors do not occur frequently in military studies, but some cases do occur. It is better to write them in Russian transcription, but when this is done it is desirable to obtain advice from a philologist because very frequently serious errors can occur, especially in the spelling of English and French family names with Russian letters.

Unfortunately, an incorrect sequence of words in a sentence and excessive and superfluous words are frequently encountered. For example, one author writes in his study: "As a result of their training, the thoughts of all army commanders changed their points of view after the war and began to adhere to different criteria for the scope of an attack". In this sentence we have a great number of literary and stylistic errors

which make the sentence completely incomprehensible. There is no need of dwelling on each of them. Suffice it to mention that with the proper writing of this sentence it would read approximately as follows: "After the war the points of view of all the leading armies of the world changed in relation to the scope of operations".

Or another example: "The saturation of combat formations of armies with equipment now imposes increased demands on their systematic reinforcement directly in the course of combat operations and primarily by means of equipment restored on the field of battle". It is difficult to comprehend the author's thought with such a combination of words. In reality, there are two thoughts present here, not one. The first is: "Systematic replenishment of combat units with equipment is now necessary directly during the course of combat operations"; the second thought is: "This replenishment must be accomplished primarily by use of equipment restored on the field of battle".

We can cite still another example illustrating how excessive and superfluous words and an incorrect word arrangement in the sentence have distorted the meaning of the sentence. "The desire to increase the lifetime of technical operation of a vehicle makes it necessary to lengthen the service time of individual assemblies which have malfunctioned or broken by means of their repair". This sentence should be written as follows: "The desire to lengthen the time that a vehicle operates correctly makes it necessary to repair individual assemblies which have malfunctioned or broken".

The incorrect burdening of sentences with explanatory words and groups is observed in almost every study prepared by a new author.

We will examine an example of this. "For conducting systematic work on the study of artillery operations, in our unit we set up an artillery equipment study group whose purpose was to demonstrate artillery equipment to all military personnel, including both soldiers and officer personnel". In order

to avoid unnecessary repetitions and simplify sentence construction it would be possible to write as follows: "An artillery equipment study group was set up in our unit for systematic demonstration of artillery to all military personnel".

Sometimes complex sentences are encountered in which conjunctions of various types are used incorrectly and for this reason it is very difficult to comprehend the author's thought. In one article the author constructed one of his sentences as follows: "The reconnaissance company was to occupy high ground with an elevation of 250.3 meters, which under the influence of enemy fire it was forced to abandon". Anyone reading this sentence might think that it was the high ground which had to retreat, whereas actually reference is to the company. In order that this be clearly understood, the word "which" should be replaced by the conjunction "but".

In some sentences an author omits some connecting links which logically hold the thought together and as a result the meaning and accuracy of the expression is lost. For example: "If the battalion attacks in the first echelon, the division supporting it in the initial position must be situated behind it, thereby ensuring the best conditions for supporting fire". In this sentence it is unclear what meaning is intended for the word "which". It is better that the word "which" be replaced by "with arrangement" and that a new sentence be begun. The thought in the following sentence is also incorrectly expressed: "In defense cold has the same characteristics as in attack". Cold in itself does not exert a direct effect on either defense or attack. It exerts an influence on personnel, combat equipment and on the passability of the terrain. This influence will differ greatly in defense and in attack. Moreover, in some cases a change in passability conditions as a result of a sharp drop in temperature can exert an obviously opposite effect. Accordingly, it is simply senseless to speak of identical characteristics of manifestation of cold in defense and in attack.

A double meaning of the text is very common when there is a mixing of forms of direct and indirect speech, as a result of which pronouns appear in the sentence in incorrect positions. For example: "The regimental commander introduced the officers to me and said that he was conducting an exercise with them". The question arises, who is conducting the exercise? Me or the regimental commander?

In many cases errors arise due to the incorrect use of words in a sentence. For example, one author writes: "Methodological developments must be perfected along the line of methodological procedures, not along the line of their expansion". It is entirely obvious that nothing can be "improved along the line of expansion". Here is another example: "The cold reduces the performance of people and machines". Here the author should write: "Cold reduces the performance of people and makes difficult the operation of mechanisms".

Sometimes an author uses a word which relates to the explanatory text as a characteristic of the main thought. For example: "The extent of the alert mission zone will be characterized by the flight speed of the aircraft and their considerable radius of deployment". It is entirely obvious that flight speed and deployment radius are characteristics of an aircraft and not alert mission zones. Accordingly, the author should write: "The extent of the alert mission zone will be dependent on the flight speed of the aircraft and the possible deployment radius".

Logical errors entering into a text have been examined in part in the chapter entitled "Application of Logic in Military Science Research" and accordingly we will emphasize here only that such errors exert a serious influence on language and style, making it incomprehensible and difficult to read.

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Chapter VII

PREPARATION OF A MANUSCRIPT FOR THE PRESS

1. General Appearance of Manuscript and Fundamental Requirements on its Technical Finalization

After the study has been written, the researcher is faced with the task of correctly finalizing the manuscript for publication. The length of time required for its processing at the publishing house, and most importantly, the quality of the final product, are dependent on how carefully the manuscript was prepared by the author. If the manuscript was prepared well from the very beginning, all the processes of its further processing are not only accelerated, but some of them can be completely omitted. For example, a manuscript which has been carefully edited in all respects, including from a literary point of view, and then retyped and proofread does not require additional retyping and proofreading, except for the correction of individual errors.

However, in most cases prior to its publication a manuscript passes through a considerable number of hands, about twenty, counting those at the publishing house: the responsible editor, main editor, reviewers, editor, correctors, technical editor, artist, etc. Each of the participants in the publishing process is interested in obtaining a high quality of the material which he handles and therefore requirements of the maximum clarity are imposed on the author's manuscript, the basic and initial link in the publishing process.

The manuscript must be neat and clean. A badly finalized and dirty manuscript by its appearance alone immediately sets the reviewers and editor against it, involuntarily creating a negative attitude toward the author as well.

The manuscript is delivered to the publishing house in fully finalized form and must include:

a) text for the cover;

b) text of the title page;

c) annotation, forward and epilogue (if all this is necessary);

d) main text with all footnotes, tables, diagrams, etc.;

e) appendices, bibliography, etc.;

f) detailed table of contents;

g) inventory of illustrations and caption texts for illustrations;

h) duplicates of footnotes, tables and formulas.

The cover must not carry any text other than the author's name and the title of the study, the year and the name of the publishing house. The most serious attention must be given to the maximum brevity and expressiveness of the title and its complete correspondence to the internal content of the manuscript.

In addition to the names given on the cover, the title page can give a more detailed title for the study. For example, on the title page of the book by K. Marx entitled "Das Kapital", in addition to the general heading there is a subheading: "Criticism of Political Economy". This subtitle affords the possibility for better understanding of the subject matter with which the author feels. The title page also gives the number of the edition and indicates under whose editorship the book is published. The name of the publishing house and the year of publication are usually given at the bottom.

The annotation gives a concise description of the content and defines the objective of the particular book, indicating the type of readers for whom it is intended. The annotation is usually brief and does not exceed 10 or 15 lines; it is placed on the reverse of the title page or on a separate page.

A forward is given in cases when the author feels it is necessary. In most cases it is written for specialized collections of articles published by military academies or institutes, when publishing documents in the field of military history and other studies.

The forward tells the reader what he will find in the book and what its special characteristics are; sometimes the forward also tells of the characteristic methodological and factual shortcomings of the book. The latter is most typical in the forward to translated books in the field of military science.

An epilogue is written in order to assist the reader in comprehending what he has read and imparting to him some additional information after he has

already become familiar with the content of the text. In some studies the nature of this dedication will govern where it is placed. If this is a dedication of a special nature, it is better to publish it on the back side of the title page and in small print. However, if the dedication is of a broad political significance, it is desirable to publish it on a separate page. Such dedications are frequently intimately associated with the book and set the tone of the book.

An epigraph is usually related to the text of the book or an individual chapter. Accordingly, it is given for the entire book or for an individual chapter. It reflects the main content of the study in more concentrated form. For example, A. N. Lagovskiy, in his book entitled "Strategy and Economy", used as an epigraph the words of M. V. Frunze: " . . . All our strategy, all our tactics are intimately related to the economic condition of the country" [1].

Commentaries given in a book give an interpretation of the published texts. They express the opinion of the compiler or editor relative to the published text. The form in which the text is accompanied by commentaries is dependent to a considerable degree on the nature of the study, governed by the type of book and the range of readers for whom it is intended.

The purpose of footnotes is to provide brief information, bibliographic information on a source, reference to the translation of a foreign text or for providing something supplementary to the described event (fact). They usually have an objective or informative nature. Like commentaries, footnotes insofar as possible must not restrict the author's freedom and must not be stereotyped for any books and publications.

The manuscript delivered to the publishing house must be typed on single pages of paper and double spaced. A margin four or five centimeters wide is left at the left side of the page. All the pages must be of a standard size and contain approximately the same number of lines and strokes in each line. In most cases a page of text is double spaced. In this case one of the author's articles will contain 22 to 24 pages with a total of 40,000 strokes.

After typing, the manuscript must be carefully proofread. It is completely inadmissible to deliver a manuscript without proofreading and correction. The greatest care must be exercised with respect to family

names and initials, references, tables, various kinds of formulas, symbols, etc. A careful checking of the manuscript makes it possible to avoid many errors. Errors in a manuscript may not be detected at the publishing house, especially errors in the figures in tables, symbols, etc. Agreement between the titles in the text and the table of contents must also be carefully checked.

All the corrections in the typed copies must be made neatly, in dark ink and legible handwriting. The paper must be of a quality such that the ink will not spread.

The manuscript must be made ready to the last detail. Any correction in pen is incomparably cheaper than correction of set type. All insertions and supplements to the text, even those which are written very clearly, are admissible only to a limited extent. If there are a large number of corrections, made carelessly, the manuscript may not be accepted by the publishing house. An ideally prepared manuscript must not contain even a single hand correction.

All the graphic materials must be appended to the manuscript in envelopes or in tightly closed cardboard folders. The gluing or fastening of illustrations in the manuscript itself is not allowed. An appropriate note is made in the manuscript in the margin opposite the place where a reference to any illustration is given for the first time; this is done with a simple pencil with the number of the illustration, such as: diagram 1, figure 2, etc.

The illustrations must be arranged in sequence number in the envelopes or cardboard folders. Exceptions are possible when the illustrations are grouped by types (diagrams and sketches, maps, photographs) or by size.

Notations are made on each envelope or cardboard folder indicating to what study the illustrations belong and indicating their type (diagrams, photographs, maps, etc.) and the total number.

The author can submit illustrations or drafts of illustrations in a single copy. However, the submission of illustrations in two copies greatly facilitates and accelerates the work in preparing publication of the book. Moreover, the better of two copies can be selected for reproduction.

At the time of submission (sending) his study to the publishing house the author must append to it a description in an arbitrary form or a form established by the Military Publishing House, but it is essential to indicate

the name of the study, the number of copies and the number of pages of all the basic parts of the manuscript and illustrative material (kinds and number). In addition to these data, the description can indicate the author's feelings with respect to deviations from the agreed length and the author's desires concerning the final appearance of the study (desired format, style and size of type, type of cover or binding, etc.).

The most important thing in a manuscript is the text, prepared in all its aspects; it must be completely literate and characterized by an excellent sequence in exposition and a uniformity in details, as well as having a structure corresponding best to the topic.

2. Preparation of Text

The structure of a manuscript is reflected in the system of headings, subheadings and notations and is reflected most graphically in the table of contents. The table of contents is actually the backbone of the book. It must contain a list of all the parts, chapters and sections, and sometimes even a list of the subsections and the smallest headings. A lack of clarity in this breakdown can disorient the reader and make it difficult to understand and assimilate the material. This lack of clarity or inadequacy in arrangement of material is easily detected from a table of contents which has been prepared in detail and therefore appropriate corrections in the text can be made in time.

Errors in writing titles and subtitles are encountered most frequently. The most important headings, which must reflect a number of subheadings, are lost amidst the text and do not stand out, whereas secondary headings are well defined and emphasized. Some chapters begin with headings of sections but others begin directly with a text. Some of the chapters are numbered and others are not. Similar and other errors in the structure of a manuscript occur most frequently in collective scientific studies.

The division of the study into parts, chapters, sections, etc., must ensure not only their coordination and the formal unification of the different units of the study, but also a logical sequence in exposition and a uniformity in the structure of the study. There are some scientific studies in which one chapter is divided into paragraphs and the other is not. Everything is dependent on the nature of exposition of the material. It would be possible

to cite a great many classical scientific studies in which the correctness of formal requirements [illegible].

Each unit of the study and each chapter are usually given a sequence number; sections within chapters sometimes have sequence numbers and sometimes do not. The breakdown of the manuscript must be done very clearly. If the headings are not numbered (chapter 1, part 2, etc.), in some cases it is useful to accompany them with Roman or Arabic numbers, capital or small letters, etc., depending on the importance of the heading. This makes the headings clearer; each category also has its own size of type, thereby facilitating reading and understanding of the study. Arabic numbers usually are secondary to Roman numbers; the latter, in general, are employed for the more important headings. With respect to use of letters, small letters usually designate titles less important than those designated by Arabic numbers. However, it should be noted that the use of numerical and letter notations must not be abused; the use of an excessive number gives the book a monotonous appearance. It is desirable that a study have no more than 2 or 3 categories of importance in titles.

It is extremely desirable that the entire book have a uniformity in the division into parts. If one part is divided into chapters or a chapter is divided into sections, it is natural to expect that the other parts and chapters will have a corresponding division. An effort must also be made, insofar as possible, to adhere to uniformity in length of divisions. The study will not appear attractive if one part is 20 pages in length and another part is 200 pages in length. However, as already mentioned, such a division is extremely arbitrary and is dependent on the nature of the study. For example, the second part of the book "Anti-Dyuring" by Engels is divided into the following chapters: the first chapter is "Subject and Method", the fifth chapter is "Theory of Cost", the sixth chapter is "Simple and Complex Work", etc., whereas the second, third and fourth chapters have the same name "Theory of Force"; the name of the third chapter is supplemented in parentheses by the word "continuation" and the name of the fourth chapter is supplemented by the word "end", also in parentheses. In reading these chapters it becomes obvious that they all deal with the same problem from three different points of view and that [illegible] had full basis for such a division.

The length of the headings is dependent to a considerable degree on the type of publication, the nature of the military science study and its literary-stylistic form. Concise laconic headings for chapters and sections are more readily comprehensible and more easily assimilated. Accordingly, an effort must always be made for brevity of a title, but not at the sacrifice of clarity.

In addition to the assignment of titles, the text is also frequently broken down.

The text can be broken down into parts for various reasons. First, in order to focus the reader's attention on some part of the text; second, in order to facilitate recollection and memorization (in a textbook and study aids); third, for making references or documents stand out; fourth, for convenience in finding the first words in indices, dictionaries, etc. A book which is entirely set with a uniform size and weight of type looks gray and monotonous. Moreover, uniformity and monotony fatigues the eye and the reader's attention wanders.

In the scientific literature the text is made to stand out more clearly for the most part by two methods: the use of different kinds of type and the use of different kinds of letters.

Different kinds of type are used for tables, formulas, some examples and references. The text made to stand out in this way can be placed in the middle of the page or it can be displaced toward the middle. In a textbook all the secondary material, such as problems and their solutions, as well as those parts of the text which are intended for conveying more detailed knowledge or for a special group of readers, can be set off by the use of smaller type.

Material is made to stand out by use of different kinds of lettering primarily for the purpose of emphasizing terms, expressions, references, definitions, conclusions, etc.

If the author desires to have his material stand out in this way he underlines the particular word in the text and in the margin he indicates the type of emphasis: "reduced margins", "brevier", "italics", etc.

In order to indicate individual words or expressions which are to be set off the author uses underlining in the text itself employing solid, double, undulating and dashed lines. The first usually indicates that the type

setter should use heavier letters, the second indicates that capital letters should be used, the third indicates that italics are desired and the fourth is for a wider spacing of letters. In addition, in the margins opposite the place for such emphasis the author draws this conventional line and along side writes how the lettering is to stand out. It must be remembered that if there is an immoderate use of such emphasis, both with respect to number of usages and in the form by which the text is made to stand out, the text will be cluttered with a good variety of such emphasis, it will be too frequent and will cease to serve its purpose.

Usually one or two types of emphasis are used and they are alternated in rigorous sequence. For example, italics are used for making the most important conclusions stand out, whereas spacing of letters is used for the initial lines of subheadings. The use of heavier letters in the text is reserved for exceptional cases. It must be taken into account that typesetting with emphasis is more expensive than ordinary typesetting.

In preparing the text of the study for publication, the author must ensure there is a proper proportion in the number of paragraphs.

Paragraphs are in essence the final expression of a single thought. A new paragraph is logically a large period. It is the beginning of exposition of a new group of sentences with a definite unity of thought. However, paragraphs are of importance not only by way of logical expediency. The use of paragraphs facilitates reading, assisting the eye in following sentences. However, it must be remembered that too frequent paragraphs make reading difficult and many times the abuse of paragraphing can cause disappearance of the very meaning of paragraphing.

In a military science study dealing with an operational-tactical topic there will usually be three or four paragraphs on one typewritten page; there may be a greater number of paragraphs in the case of studies dealing with military technical topics. It is useful to alternate long paragraphs with short ones, auxiliary paragraphs which serve as a sort of transition from one thought to another.

Paragraphs also facilitate the correcting of proofs, when words are inserted or removed.

Young authors frequently make errors in dividing their text into paragraphs; sometimes closely related sentences are separated in a number of paragraphs or the last sentence is put into a separate paragraph.

In some cases it is necessary to use abbreviations in the manuscript text and the author must know how to use them correctly. The abbreviations of individual words and concepts, names of positions, military institutions, units, etc., are admissible, for example, in the text of a military order or report but are entirely unsuited to the text of a study in military science.

A book looks better which has only a minimum of accepted abbreviations which are used in the military literature, such as (in Russian): PVO (antiaircraft defense), VMF (Navy), VVS (Air Force), NZO (fixed barrage fire) and others; gg. (years), i dr. (and others), i dr . (etc.), mln. (million), tys. (thousand) and others.

In studies devoted to a very specialized subject the very same terms are very frequently repeated in the text. It is advantageous to abbreviate these repeating terms, but when they are first written they must be given in full form with the abbreviated form in parentheses; thereafter they can be used in abbreviated form. For example, if the words "regimental artillery group" (PAG) is used frequently, in the text which follows it is admissible to use the abbreviation PAG. A number of other abbreviations are also admissible. However, it is quite impossible to use such abbreviations (in Russian) as "sootv." (corresponding to), "ok." (about), "t. k." (because) and others and especially abbreviations of vowels, adjectives and nouns.

If numerical notations do not follow the abbreviation No. and the symbol §, etc., they must be expressed in words: "number", "paragraph", etc.

The author also does poorly if he attempts to explain fully the generally used abbreviations which are quite familiar and accepted in the military literature. In such cases the text is overburdened and it is less easy to read.

In case of necessity the text of a book is accompanied by footnotes of different kinds and references.

Footnotes and references, when intelligently used, make a text more comprehensible and convincing and facilitate the assimilation of what has been written. Footnotes must be written concisely and used only in the most

necessary cases. If there are many footnotes and they cannot be avoided it is better to put them at the end of the book. In some cases it is possible to explain terms in parentheses in the text itself; in such cases it is undesirable to have footnotes. Only those explanations whose placement in the text interupts the thread of thought should be put at the bottom of the page or in a footnote.

In the military science literature it is common to give references to various kinds of sources: archival materials, materials from army exercises, sources in the literature, etc.

References to footnotes are indicated in the text by a small Arabic superscript which is placed a little above the line directly after the word or phrase to which the footnote applies.

All footnotes and references are numbered in sequence on a particular page. There can be exceptions when there is a double system of references, for example, in translated literature there can be footnotes from the author and footnotes from the researcher.

The system of footnotes and references must be well thought out in each individual case, selecting the most rational system for each study. Data on each book or article mentioned in the reference must be arranged in the following order: author (initials, last name), name of study, volume, part (Roman numerals), publishing house, place of publication, year of publication, pages to which the author refers, for example: F. Engels, Izbrannyye Voyennyye Proizvedeniya (Selected Military Writings), Voyenizdat, Moscow, 1957, p. 250.

Another highly important task of the author is the proper writing of the references. In so doing the author must remember that the burdening of a text with an excessively great number of references, particularly long ones, cannot be allowed. It is better to put operational orders, reports, summaries and other documentary material of value as auxiliary material to the text at the end of the book, in an appendix, and give only references to them or conclusions in the text.

In all cases of incorporation of references or documents in a study it is mandatory that a precise reference be given to the literature or archival source from which the material was taken. A careful checking of all references

and documents by sources is the obligation of the author, who bears all the responsibility for accuracy in references. A reference must correspond fully to the original with adherence to all peculiarities, especially spelling, punctuation and the spacing of lettering or the use of special kinds of type. Within a reference there must not be a combination of individual statements by an author from different places in a single book in a single sentence. Each quotation must be given in independent quotation marks with separate footnotes or a common footnote.

The placement of three dots or periods at the beginning of a reference indicates that the statement is not quoted from the beginning of the sentence; multiple dots or periods in the middle or at the end of a reference, in front of quotation marks, indicates that part of the text has been omitted. In cases when the author cites individual words of a statement or cites some statement without giving it word-for-word, quotation marks are usually not used and the footnote is given with the additional words "See". For example: "According to data in statistical materials on the military efforts of the United Kingdom, presented to the British Parliament in November 1944, the number of males in the armed forces of Great Britain in mid-1944 was 4,500,000. (See "Great Britain During the War Years. Figures and Facts." British Alliance Publishing House, Moscow, 1945)". (Translator's note: since this Russian Publication is cited only as an illustration of the arrangement of the footnote, its transliteration is not given.)

Military research studies usually contain a considerable amount of numerical data. Tables, formulas, military statistical calculations and various kinds of counts of manpower and equipment are included in almost every study in military science.

In most cases the figures cited by the author cannot be checked and corrected by anyone other than the author. Accordingly, he bears the entire responsibility for the correctness of numerical data.

Tables included in the text or placed in appendices must be checked with particular care. Experience shows that they always contain a large number of errors. The proper arrangement of the numberical data must also be given attention.

Foreign words are encountered relatively rarely in the military science literature on operational-tactical topics, but they are rather frequent in

the military technical literature. In some cases the need arises of giving references to and extracts from the foreign literature, as well as references to sources, but in most cases foreign personal and place names must be used.

Young authors of scientific studies frequently make excessive use of foreign terms and extracts or quotations in foreign languages, especially in those studies in military science in which the works of foreign authors are employed. When giving the names of foreign authors, the name must be given in the text in the proper Russian transcription when it is first mentioned. At the same points the original spelling should be given in parentheses, the same as in the original. Thereafter the author need give only the Russian transcription. When checking foreign texts at all stages in preparation of the manuscript it is desirable to consult specialist who are masters of the particular foreign language.

3. Preparation of Illustrative Material

Well-selected and properly executed illustrations constitute a very important part of a manuscript. Illustrations are particularly important in military science studies intended for a wide range of readers and in textbooks. The latter are completely unthinkable without illustrative material.

However, a manuscript must not be overloaded by illustrations; the author must select those which are most important, necessary and original.

Illustrative material, such as diagrams, figures, sketches, photographs, maps, drawings, etc., must be organically related to the content of the study and constitute an integral part of the text. If this is not the case, even beautifully executed illustrations lose their meaning and simply become pictures. In a study in the field of military science only those illustrations must be included which explain or supplement the text. Every illustration must be carefully thought out by the author and prepared for publication.

In a scientific research study an illustration is on the same level with the text. It must be presented in such a way that upon examination its content is immediately clear, as if it spoke for itself; the caption beneath the illustration should only afford additional assistance. No unnecessary details should be included in the illustration.

Illustrations must be submitted by the author either in the form of drafts suitable for reproduction by an artist or draftsman, or in final form, permitting

the preparation of stereotype plates directly from the submitted originals. In the latter case the author must have conformed to all the technical requirements imposed on a diagram or drawing intended for reproduction.

A draft of a diagram, drawing, map, etc., must be prepared in such a way that it can be easily analyzed and a final draft prepared. The draft is made in pencil or ink. If the author is afraid that the draftsman (cartographer) cannot understand his thoughts, explanations of the illustration must be written, making the annotation: "For the draftsman only". In the preparation of drafts of operational-tactical diagrams the author must adhere to all the symbols approved by the regulations of the Soviet Army.

All the notations made on diagrams, maps, sketches, etc., as well as the legends and explanations must be carefully edited and made in full accordance with the text of the study.

The explanatory notations on the illustrations are not made on the illustrations themselves, but at the side on the margins or on the reverse with a simple soft pencil without applying pressure. No notations can be made on the face side of the photographs (even with a simple pencil). If there is need for such notations they must be made on a sheet of tracing paper glued to the photograph on the backside and then folded over onto the face side.

If any parts or components designated on the illustrations by figures, letters, conventional operational-tactical or topographic symbols are listed in the text or the illustration caption, there must be no lack of coordination throughout the entire study in these designations and the references to them. Special attention must be given to symbols which are similar in configuration because it is here that confusion most often arises.

The caption for an illustration includes a sequence number and the title of the illustration, insofar as possible a brief name and explanatory text, such as a list of the parts shown in the diagram of the figure, references to the sources from which the illustrations were taken, etc.

The symbols are usually placed on the illustration itself, in a free corner within the frame.

Very frequently photographs are used in military science studies as illustrations. In order for the photographs to be reproduced they must be of a

high quality. In particular, it is necessary that the photograph be clear and printed directly from a negative on good photographic paper. If the photograph does not require retouching it is better that it be prepared on glossy paper. If the author takes illustrations from earlier published printed sources, they can be submitted to the publishing house in cut-out form. If an illustration cannot be cut out it can be photographed.

When the author submits illustrative material to the publishing house it is essential to indicate in what place of the book each illustration is to be placed (within the text, as an insert, in the appendix, etc.), and the admissible reduction of the illustration so that after its reproduction in the published book it will not be excessively small nor unjustifiably large. The author makes a note on each illustration indicating what degree of reduction or enlargement is necessary in his opinion. The reduction is indicated in the form of a fraction (one-half, one-quarter, etc.). In some cases the size of the illustration is indicated in centimeters.

If the size of the original must be retained, an appropriate note is made to this effect.

In the case of illustrations whose correct position cannot be determined from their external appearance it is necessary to write "top" or "bottom". It is also desirable to prepare a list of illustrations. The list of illustrations for inclusion in a book as reference detail is prepared separately from the working inventory and contains references to those pages of the book where the illustrations will be printed. The list of illustrations can include explanatory information which is absent in the captions.

4. Indices

Indices are a highly important part of the scientific reference structure of the study. Using the indices the reader can obtain a detailed familiarization with the range of subject matter considered in the book, find the necessary reference for comparison and refinement of any formulation, find some term, name, etc.

The compiler of the index must always clearly represent the book so that the reader, in scanning the index, can immediately determine whether the book is suited for his work or not and find the necessary reference. A false

reference or the omission of important subjects in the index can confuse the reader and he will not use this book even if it contains needed information.

Preparation of indices is no simple matter. Much skill is required in this work.

With respect to the nature of the reference material, the military science literature in most cases includes subject and bibliographic indices, an index of geographic names and a chronological index. In structure, indices are usually alphabetical and specialized. In contrast to an alphabetical index, where everything is strictly in alphabetical order, in a specialized index the presentation is made in accordance with a classification determined by the author.

For example, the reference volume to the fourth edition of the writings of V. I. Lenin, prepared by the Institute of Marxism-Leninism of the Central Committee Communist Party of the Soviet Union, published in 1955-1956, consists of two parts. The first part includes a subject index and the second part consists of an alphabetical index. The subject index includes the fundamental problems, definitions and concepts constituting the content of the book or only mentioned in the text.

The selection of terms, place names and personal names which must be incorporated in the index is the most difficult task in the preparation of subject indices. The compiler must remember the basic rule of guidance for compilation of an index, that is, an index is not an encyclopedic dictionary. It must only guide the reader, assist him in analyzing the content of the study. The mechanical entry of all terms, place names and personal names encountered in the study, even those which are simply mentioned, can result in overloading the index.

It must be remembered that an index is a list of titles, each of which must correspond in the study to fragments of the text, contain a definite contribution on a particular subject or [illegible] information concerning some individual or term.

Indices give references to pages. For each term the index gives one reference to the page where the author has made fullest use of this term; several references are made to a number of pages where the term is mentioned. The reference to the page on which the term is used most fully occupies

the first place after the term (regardless of the sequence numbering of the pages). For example: "Meeting engagement -- 132, 70, 121, 302, 352, 372, 382". If any term is repeated in subsequent terminological word combinations, the repeating word is replaced by a dash. For example: "Initial region for attack -- 195, 183, 287, ---- defense -- 231, 358, 360".

Indications of the location of an illustration (diagram) are given in parentheses along side the reference to the page. For example: "Surrounding of the Stalingrad grouping -- 153 (diagram 5)". If the diagram is on an insert, the reference is given to the preceding page.

The subject index gives both those concepts which are used in the text and those which have been established by the author for the purpose of explaining concepts encountered in the text.

A problem which represents considerable difficulties is which concepts to relate to the principal headings and which to relate to the explanatory headings. In solving this problem it is necessary to take the following considerations into account. A heading must reflect the main concepts and a subheading must reflect a characteristic (peculiarity, detail) of this subject.

For example, in the term "military art", the words strategy, operational art and tactics are subordinate to it. The index should be prepared as follows:

Military art:

strategy -- 15;

operational art -- 17;

tactics -- 21.

The subject index can be prepared by the author himself or by someone else.

A bibliographic index is given at the end of the book. It is frequently prepared both unsystematically and incompletely; such an index is without scientific value and only detracts from the publication. For example, the index gives only the last name of an author and the name of the journal, the name of the article and year of publication not being given, or the index only indicates the volume and the number and page remain unknown. In other

cases incorrect abbreviations are used for the data presented in the bibliographic index. 1.

In preparing a bibliographic index the author must be guided by the following considerations:

a) the index is prepared rigorously in alphabetical order;

b) the last names and initials of the author are to stand out by use of a different style of type or by use of spaced letters; the title and academic degree are placed after the last name and initials, separated from them by a comma, but do not stand out in any other way;

c) the name of the study is written without quotation marks or typographic emphasis after the last name and title of the author. If a source from which the study is taken is indicated, the name of the source (journal, collection of articles, etc.) is enclosed in quotation marks;

d) all abbreviations in the entire index must be uniform, for example (in Russian): t. (volume), ch. (part), vyp. (number), izd. (publishing house), kn. (book), str. (page), M. (Moscow), etc. The (Russian) letter "g" is not used with the year of publication (for example, M., 1956);

e) there must be rigorous adherence to the general sequence within the bibliographic listing: author, title of study, source, volume, number, part, chapter, page, place of publication, year of publication, for example: Lagovskiy, A. N., Colonel. Strategiya i Ekonomika (Strategy and Economics), Voyenizdat, Moscow, 1957.

The technique for compiling a bibliographic index is the same as used in alphabetization. Usually all the necessary information for this purpose is collected either in an individual notebook or in the form of individual cards. The latter are far more convenient and therefore are used most extensively.

Bibliographic indices can have a definite specialized division, for example: classics of Marxism-Leninism, regulations and instructions and other official publications, literature, archival materials, etc.

Within each of these specialized units the index is also organized in alphabetical order.

References

1. Lagovskiy, A. N., *Strategiya i Ekonomika (Strategy and Economy)*, p. 3, Voyenizdat, Moscow, 1957.

Chapter IIX

METHOD FOR ORGANIZING WORK IN THE FIELD OF MILITARY SCIENCE

1. General Requirements on the Organization of a Military Science Study

A military science study is organized on the basis of corresponding orders, directives and instructions of superior echelons. Such a study can be made in many directions, taking into account the specific nature of the day-to-day activity and earlier experience in military science work of the corresponding military unit, institution or establishment.

The experience accumulated by the Soviet Armed Forces shows that in the course of military science work a number of problems are solved which increase the combat capability and combat readiness of our forces. At the same time, this work favors an increase in the knowledge of military theory by officers and indoctrinates a new feeling in them, develops initiative and creativity in approaching the solution of many problems in the practical activity of an officer both in peacetime and under complex combat conditions. This makes work in the military science field a necessity and also dictates its content and character.

Constant concern for the broad development of work in military science and its day-to-day supervision is one of the basic obligations of commanders and leaders at all echelons. Every officer and reader, bearing in mind the great importance of work in military science, must plan, direct and check the activity of his subordinates in this field, ensure purposefulness in the work, see that it is directed to the solution of timely problems and that good results are obtained.

Experience shows that in order to achieve this it is most important to determine correctly the subject matter for the research, have the broadest possible number of his subordinates participate in military science work and rigorously plan all the work, be able to create groups of authors, organize scientific and methodological assistance for researchers and at all times instruct them in the application of Marxist-Leninist theory and methodology in military science research so that these studies will be permeated by Bolshevist ideology and constructed on a rigorous scientific base.and prove to be useful for our Armed Forces.

In directing military science work it is necessary to ensure a broad development of criticism and self-criticism in the course of the research and a high discipline among the researchers, thereby ensuring the completion of all the planned studies precisely at the fixed times and with a high quality of the product. In case of necessity, and when it is possible, the theoretical points being studied must be checked by army practice. Moreover, a constant liaison must be maintained and the experience from military science work must be exchanged with other units, institutions and establishments.

Party and Komsomol (Young Communists) organizations can be of great assistance in solving the highly varied and complex problems in military science work. The raising of questions at Party and Komsomol meetings on various aspects of military science work, the systematic presentation of reports by researchers on their work on the development of their topics at the Party Bureau, the organization of comradely assistance to a number of researchers and other corresponding specific conditions in the form of Party political work to a considerable degree determine the scope, content, ideological-theoretical and scientific level of research in military science.

One of the most important conditions for the success of military work is its correct, purposeful and specific planning. In planning the work it is most important to ensure a timely and high-quality completion of the assigned research. The key role in these studies must be played by the officers and generals most experienced in military science work. Less experienced researchers are included in the groups working on specific topics. This creates conditions for the creative growth of young scientific personnel in [illegible] with and under the direction of more experienced officers.

The military science studies next in importance are those which meet the requirements of a particular military unit, institution or establishment. For example, topics related to the instruction and training of troops, the use and care of military equipment and arms, illumination for the combat path of a unit, study and popularization of heroic feats and traditions, selection and profound analysis of combat examples for illustrating a number of theoretical points arising in the analysis of military exercises, etc., are of great timely importance for military units. Among the problems proposed by the planning group itself, only those are included in the plan which can be fully studied during the course of the planned period.

The assigned and proposed topics determine the content of the plan for military science work.

The plan for military science work must be prepared well ahead of time, essentially for an entire year preceding its proposed execution. Constant supervision must be given to the course of work in military science. The topics being studied must be analyzed and the results obtained during the work must be studied. It is necessary to determine the problems which are no longer timely or which are becoming particularly timely. It also is determined what types of military science work are most effective and under what conditions and the most thoroughly trained research groups and individual researchers are determined. In the course of combat and political training decisions are made on what questions merit theoretical study. All this is accumulated and studied during the entire year. However, directly before preparation of the plan for military science work there is a thorough generalization and analysis of the data collected during the year.

The plan for military science work must not be overburdened with a great number of highly different military questions. This plan must first be purposeful, ensuring the primary solution of fundamental problems in military science and the expedient organization of resources for achieving the set goals. Second, it must be fully realistic, that is, it must rigorously take into account the capabilities of the officers and generals for developing the particular topics, the availability and possibility of using different kinds of sources and the time required for the work. Third, it must give a full idea as to what work will be done, by whom and when, what scientific result is to be expected, and what sequence the work will take and in what form.

The form of a plan for work in military science can differ. It must be noted that regardless of the form of the plan, at its beginning it is desirable to give the general objectives and the goals of military science work during the planned period, reflect the most important and most timely theoretical problems which require immediate solution and to whose implementation the greatest efforts must be directed.

The plan must indicate: title of the subject, who is working on it, objectives of the research and the results which must be attained in the course of work on the topic; time allocated for completing the work

(beginning, author's work and finalization) and the form which it is to assume. For convenience in using the plan it is desirable that the topics be arranged in a definite order, by types of work or by definite echelons in which these studies are to be made.

The proposed plan must be subjected to broad discussion. Thorough and profound scientific criticism will favor a serious improvement in the quality of the plan.

The planning of military science work must not be confined to a small group of persons. The researchers who are to work on the topics must participate in work on the plan from the very beginning. They must immediately undertake the preparation of calendar plans and begin to devise a method for work on each topic. This is necessary in order to determine realistic times required for developing all the topics, assuming they are not assigned by a superior commander. Moreover, with this planning arrangement there will be no subsequent profitless expenditure of time by researchers in becoming familiar with the assignment and no panic and confusion among authors and groups of authors. If they participate in the planning from the very beginning, after approval of the plan they need only refine their missions and in accordance with these refinements make necessary corrections in their calendar and systematic plans.

The organization of military science work provides for control and checking of the researcher and assistance on the part of experienced comrades. When this is done systematically and purposefully, rather than at random, it favors an increase in responsibility among researchers for the work delegated to them and makes it possible to detect inadequacies in the execution of military science work in time, also revealing the reasons for these shortcomings and making it possible to eliminate them. Checking and assistance must not be done at the end of work on a topic, when in many cases it is no longer possible to correct errors, but from the very beginning of research and during all its subsequent stages. In the absence of such checking it may happen that time will be lost and as a result the jobs will not be finished in time or will be finished in haste, which undoubtedly will result in a lowering of the quality of the work.

Checking and assistance are ensured particularly for the most important studies. This checking must not be reduced to a simple statement of facts,

such as: the calendar or working plan has been prepared or such and such a chapter has been written. The most important aspect of checking is a determination of to what extent the authors have mastered the problems facing them, whether they have correctly planned ways to develop theoretical problems and the quality of work already done.

The military science studies which are made must be published without fail. Only under this condition will they serve to enrich and develop military science and increase the combat readiness of our forces. At the same time, only a timely publication will give a definite moral satisfaction for the researcher. He sees that the fruits of his labors have not been wasted and this will inspire him in his subsequent creative work.

The forms of publication vary: reports at military science conferences and meetings, lectures and reports, adoption of the results in the combat and political training of troops, use for theoretical training of officers in his unit, publication in the form of a book, brochure or article. Publication is undoubtedly a higher form of dissemination, because in this way the results of the work reach a broad range of military readers. However, this does not mean that other forms of dissemination can be underevaluated. On the contrary, all other forms must be used as extensively as possible, at the same time making provision for the publication of those studies which merit this according to the evaluation of the scientific community.

The results of military science work must be summarized at the end of the year. This requires a thorough analysis and discussion of the results, determination of the shortcomings present and their reasons and ascertainment of ways to further improve military science work. It is desirable that the summarization of the results for the past year take place together with the discussion of the plan for military science work during the coming year.

2. Organization of Work of Military Science Societies

The military science societies existing in the army and navy play an important role in the development of Soviet military science and in strengthening the military power of the Soviet Armed Forces.

Voluntary military science societies have a long history which began during the heroic years of the Civil War. The first military science society was established in the autumn of 1920 in the Military Academy of the General

Staff of the workers' and peasants' army (now the Red Banner, Order of Lenin and Order of Suvorov First Class Military Academy Imeni M. V. Frunze) on the initiative of students who were members of the Communist Party.

The Communist students, active participants in the Civil War, understood that armies of the new type require military science developed on the basis of the life-giving teachings of Marxism-Leninism. The Military Science Society was established for attracting a large number of leaders of military personnel to the solution of this extraordinarily important and very complex scientific problem. Its membership included not only students who had a very rich combat experience during the Civil War, but also leading instructors and former military specialists of the old Russian army who had honorably changed to the side of the Soviet rule.

The first and permanent chairman of the Military Science Society, to the very last days of his life, was Mikhail Vasil'yevich Frunze, who was able to combine this work with great governmental and Party activity.

The work of the Military Science Society was highly varied and organized on the basis of the collective creativity of all its members. At the sessions of the study groups and sections there was discussion of the principle and organizational forms of structure of the Armed Forces of the Soviet republic, problems involved in military theory and practice, the history of military art, drafts of new regulations and instructions, etc. Much attention was devoted to the problems involved in applying Marxist dialectics in military art.

In this atmosphere of scientific creativity there was a dearth of new ideas, advanced studies in military theory were written and a cadre of young military science workers was trained which was capable of developing problems in military science from the Marxist-Leninist points of view.

Due to the active work of the members of the military science society its activity within a short time extended beyond the walls of the Academy; divisions of the society were established throughtout the Red Army. For this reason it bacame necessary to organize the activity of this society on an army-wide scale.

The achievements of the Military Science Society have been widely published. The first publication of the Military Science Society was the

journal "Krasnaya Armiya" (Red Army). More than 400 articles on various aspects of military art were published in this journal. The second publication of the Military Science Society, the journal "Voyennyy Zarubezhnik" (Military Art Abroad) began its appearance in 1921. In addition, collections of papers of the Military Science Society were published, together with collections of papers from various sections of the Military Science Society (artillery, air force, etc.) appeared, as well as individual studies in military science. During the years 1922, 1923 alone more than 50 military science studies were published. A series of books entitled "Biblioteka Krasnoarneytsa" (Library for the Red Army Soldier) was published for rendering practical assistance to the army.

During those years the Military Science Society played a major positive role in establishing and developing Soviet military science. It was one of the main vehicles for the line of the Communist Party, directed to the introduction of military science work in day-to-day service activity of commanders. Naturally, with a change in the role and significance of this work as a service function of all branches of the Soviet Armed Forces, there was a change in the content, form and methods of work of the Military Science Society and its structure.

The Military Science Societies now in existence have the function of working on problems in military theory, modern methods for waging combat and operations, modernization and introduction of new arms and combat equipment, increasing the quality of combat readiness, indoctrination of skills in the method for conducting military science work by officers and generals and facilitating the development of inventive and rationalization work.

An intelligent organization of the work of military science societies and a search for forms and methods of work which correspond to the greatest degree to the conditions for functioning of each society are of great importance for the successful solution of these problems.

Military science societies are voluntary organizations. The higher echelon of a society is the general meeting of all its members; for directing the work the meeting elects a council with a term of office of one year.

The organizational structure of military science societies can vary, depending on their makeup and working conditions. The most important

consideration here is ensuring flexibility in the work of the society and creating conditions for the successful accomplishment of the work undertaken both by the society as a whole and each of its individual members. In some cases division, sections and study groups may be established, whereas in other cases only sections or study groups may exist; finally, the society may consist solely of study groups or there may be no structural subdivisions at all.

Divisions of a society are usually established when there is a large number of members in order to improve direction of their work. For example, divisions of a military science society can be established at military colleges in different faculties or courses. In such a case a council is elected for the military scientific society of the individual course or faculty.

These sections unite the work of the society members on definite broad problems. For example, the following sections can be established: operational art, tactics, methods of combat training, Party political work, history of military art, etc. The number and designation of the sections is dependent on how many members the society has and on what problems they are working, as well as on the nature of their service assignments.

It is desirable that study groups be established if a single section is working on a quite broad range of problems in order to achieve more purposeful and effective work and for the members to render each other mutual assistance. For example, the section on general tactics can have individual study groups for work on problems relating to attack combat, defense, forcing of rivers, meeting engagements, etc. The number of study groups is determined by the number of members in the society desiring to participate in military science work on some particular topic. However, as experience has shown, a study group should not consist of more than 15 individuals.

The content and form of the work of the society as a whole, the sections and study groups, can vary greatly. This is governed by the makeup of the society, work experience, nature and conditions of military assignment of its members. However, after the society is established it is usually desirable to study the principles of the method for military science research at the first meeting of its study groups or sections.[1]

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[1] See p. 333.

The number of meetings devoted to this purpose and their content will be dependent on the level of scientific-methodological preparation of the members of each particular study group and on the future direction of their military science work. At these meetings there can also be study of such problems as the methods used in military science research, work on sources in the literature, archival materials, collection, systematizing and analysis of facts, use of materials from army exercises and the experience of army practice, application of Marxist dialectics, logic, statistics in military science research, preparation of a working plan and final plan or prospectus, literary finalization of the manuscript, etc. It is also desirable to study the peculiarities in work on individual types of military science studies: synopses, articles, review, brochures, etc.

All the meetings on a particular topic can be prepared by the members themselves. This book, and similar study aids, can be of a certain assistance in such work. However, if it is possible to invite a comrade who is more experienced in military science work for conducting such an exercise, this possibility naturally should be exploited. Some of these meetings can be conducted by the seminar method; others can consist of presentation of a report with its subsequent discussion.

It should be emphasized that this, so to speak initial stage in the work should never be neglected. The study of the principles of the method for military science research awakens attention, arouses the interest of members of the society and renders great assistance in the direct execution of military science work.

The next stage is independent work of each of the members of the society on a particular topic. The skills of military science research can be acquired only as a result of independent work. However, work in the society can be of considerable assistance. At the meetings of the study groups there can be discussion of the working plans of members of the society, individual parts of the research and the finalized studies. Comradely assistance, critique of shortcomings and friendly advice, undoubtedly will be of assistance in developing skills in military science research and in increasing the quality of creative work by each member of the society.

In addition, the members of the study groups must be delegated work on preparing and presenting information on various aspects of military art,

associated with the direct practical activity of a researcher can lead to valuable scientific results, to the formulation of new and more effective methods for using any type of arms and equipment, to the proposal of a number of additional tactical-technical requirements, etc.

In addition to work by society members on independent topics, individual study groups can work on topics collectively. For example, one of the study groups can work on a topic dealing with combat operations of a subunit in a meeting engagement. In this case one or more members of the group can be delegated the task of studying problems involved in organization and conduct of a meeting engagement as illustrated by the experience of the Great Fatherland War and others can investigate the conditions surrounding the occurrence of a meeting engagement under modern conditions. Still others can study the use of various combat techniques in a meeting engagement, the organization of various kinds of support, command, etc.

The most important advantage of the collective form of work is that all members of the study group have a common interest in work on a single topic. It also ensures a high activity in discussion of various problems and ensures depth and thoroughness in the study. The results of collective work can be presented for discussion at a conference of the society in the name of the entire group and be disseminated in the form of an article, brochure or book.

The planning of the work of a military science society is conducted in accordance with general requirements. The only peculiarity is that the preparation of the working plan for the entire society begins at the bottom. Every member of the society indicates his topic and the time when it is to be completed; then the groups (sections) generalize all the proposals of their members, incorporate them into their unified plans, which also include the general undertakings of the group (section). In this form the plans are submitted to the council of the society, which analyzes them and draws up a general working plan for the military science society. Such a plan is usually prepared for a year. The society council in this plan not only provides for undertakings proposed by the groups and sections, but the subject and time for holding military science conferences and scientific meetings, lectures and reports for the purpose of increasing the theoretical background of the society members and their methodological skills. This plan also provides for

excursions, the presentation of military science films, meetings with participants in the Civil War and the Great Fatherland War and other measures.

The draft of the working plan of the society must be presented for thorough discussion at a general meeting. This discussion not only makes it possible to refine and improve the plan, but will also facilitate the mobilization of society members for its unconditional implementation.

After approval of the society working plan, the plan of the divisions, sections and study groups are made more specific. It is desirable that these plans include both the general undertakings of the council of the military science society and the undertakings of the sections (divisions) and study groups.

The success of the work of military science societies is highly dependent on the competent work of the council of the military science society.

The council of the military science society plans work and checks and assists the sections and study groups. The meetings of the council must be held as necessity dictates, but not less frequently than once per quarter. Participants at the council sessions can discuss all problems relating to the work of the society and hear reports on the work of the sections, study groups and individual members. The council presents the most important and particularly timely of the investigated topics for dicussion by the entire society at military science conferences and meetings. This results in collective assistance to individual authors and entire groups of authors. At the same time, such measures considerably activate the work of the society.

The successful work of the study groups (sections) is dependent to a considerable extent on their directors, particularly on how correctly they understand the tasks assigned them, whether they are capable of inspiring the interest of researchers, whether the work is planned correctly and how it is supervised from day to day.

The director must be a model of activity and conscientiousness in military science work, exhibit discipline, be able to create a harmoniously working group, establish a businesslike and friendly mutual understanding among its members and ensure that meetings are held in the spirit of creative discussions. At the same time, he must exercise control over the work of the members of the study group. Accordingly, the problem of selecting

directors, commanders (leaders) and councils of military science societies must be given close attention. It is desirable that a systematic exchange of new experience in the direction of scientific themes be organized.

The holding of conferences and dissemination of completed and approved studies by society members is very important in the work of military science societies. This stimulates the further work of society members in their creative studies and has a positive effect on the work of the entire society.

Although the work of military science societies is voluntary, taking into account its importance in the strengthening of the defense capability of our Motherland, commanders and leaders, Party and Komsomol organizations must devote much attention to this work.

Commanders and leaders must constantly direct the work of military science societies, define the objectives and purposes of this work, conduct measures for strengthening these societies and create favorable conditions for their work.

Party and Komsomol organizations must actively assist in the work of military science societies, facilitate the entry of Communists and Komsomol members into the societies, ensure their leading role in the performance of the work which they have undertaken and develop creative initiative, criticism and self-criticism in the discussion of the topics on which they have worked and the activity of all the society.

3. Organization and Holding of Military Science Conferences, Meetings and Discussions

Military science conferences and meetings, as well as various kinds of discussions, are held for a thorough discussion of the most important problems in military theory and practice, for exposing them to the judgment of the broad military science community and for bringing about a uniformity of point of view on these problems. The holding of these events also favors a broadening of theoretical knowledge and the horizons of the officers and generals participating in them, as well as drawing their attention to the study of the most important immediate problems in military art.

Military science conferences are the most complex and large scale events of this type. The most significant results are expected from them. However,

in order to achieve these results it is necessary that every such conference be prepared thoroughly and carefully. In particular, care must be given to the proper selection of the conference participants and ensuring their preparation for active participation in the event. However, the most important condition for ensuring this is the timely submission to the conference participants of high-quality materials on the subjects which will be open for discussion.

Depending on conditions, the conference materials can be disseminated to its participants in various forms. For example, if plans call for discussion of an already published research study, the study itself is the best material. However, if the research study to be discussed cannot be published prior to the conference or if this is undesirable, summaries or abstracts can be prepared which in concise form set forth the basic content of the particular studies. The conference materials can also be prepared and disseminated in the form of the full text or summaries of reports to be presented by individuals or groups.

Regardless of the form in which the conference materials are disseminated to its participants, they must clearly cover the nature of the most important problems to be discussed, their content must be revealed and specific proposals must be formulated. It is also desirable to emphasize which of these problems are the most debatable so as to concentrate the attention of conference participants on them. If all this is not done, the soil will not be prepared for active creative discussion.

With such preparation of a conference its participants will study the problems open for discussion and prepare their commentaries on the basis of the written materials and not on the basis of the reports heard at the meeting. In this connection the oral reports should be very brief. In the oral reports only the most important aspects of what has been set forth in the written materials should be presented, in very concise but convincing formulations, placing the main emphasis on the new results obtained as a result of the research, which of the conclusions require additional checking and what should be discussed with particular depth and thoroughness. Long reports in which the speaker reformulates points already known to the conference participants lead only to a superfluous waste of time and reduce interest in the discussed problems. Moreover, in general, conferences should

usually not be overloaded with reports by individuals and groups so that there will be more time left for discussion.

Military science conferences can be held for the most part by two methods. In the first method the presentation and discussion of reports by individuals and groups occurs at a general (plenary) session of the conference. This method is advantageous in that all conference participants keep abreast of all its work and can participate in the discussion of every problem. However, when this method is used much time is required for the discussion of a broad topic and it scarcely can be discussed with sufficient thoroughness. Accordingly, this method should preferably be used in holding conferences only in those cases when one important problem or two or three closely related problems are discussed and when it is necessary to obtain the opinion of a large number of officers and generals.

In the second method only reports of the most general nature are presented and sometimes partially discussed at a plenary session. Other reports by individuals and groups are presented in section meetings. These reports are discussed in the sections and the discussion of reports presented at the plenary sessions is continued. The generalized results of work of the sections are reported at a later plenary session. A positive aspect of this method is that work in section meetings makes possible the simultaneous exmination of a wide range of problems in a broad area during a short interval of time. Accordingly, this conference method is usually employed in those cases when the conference theme can be divided into a number of subthemes.

In every case the selection of conference participants is determined by specific conditions. However, in all cases an effort must be made to ensure that the broadest possible range of officers and generals from the various branches and services of the army will participate in the conference. Experience also indicates that it is desirable that officers and generals from other military units, staffs and academic institutions be invited to the conference. First, this makes it possible to obtain the latest information concerning similar or related studies made by other units, staff, institutions and establishments. Second, the addresses or commentaries of the guests frequently can reveal a different approach to the study of the problems under discussion, and this is very important for further work on the subject.

When holding a conference much attention must be devoted to seeing that its atmosphere is filled with a spirit of creativity and a quest for new discoveries so that the conference participants will see that they are required at the conference, that assistance is expected from them and that even their sharpest but healthy criticism will be listened to with respect and in the course of further work will be subjected to careful study and analysis for the purpose of extracting from it everything which is useful for further improvement of the study under discussion.

It is difficult to give any definite recommendations on the creation of such an atmosphere at conferences. However, any director, if he undertakes such a task undoubtedly will be able to find appropriate ways to create such an atmosphere. In any case, no "details" can be neglected along these lines. The timely dissemination of conference materials to the conference participants, the quality of these materials and an attentive attitude toward conference participants are also of importance. It is scarcely necessary to mention that during the course of a conference there must be no interruption of speakers, especially anyone who is criticizing the proposals and conclusions of speakers. The registry of the addresses is also of great importance. The lack of records seemingly indicates that the conference directors do not expect anything useful from what is said. Now that the tape recorder has become commonplace there are no difficulties in arranging such recording. It is very important that the speaker himself read his own record and introduce corrections into it while the conference work is still in progress.

Experience shows that in many cases that conferences lasting even a few days not all those who desire to speak can be heard. Accordingly, the work must be organized in such a way that all officers and generals who could not speak will have their prepared addresses recorded.

After a conference is held the results must be carefully studied and generalized. It is usually desirable to publish all the conference materials or at least duplicate them by typewriter for the officers' library.

The method for preparing and holding scientific meetings is largely the same as for military science conferences.

Scientific meetings differ from conferences in that there is discussion of narrower topics or a small number of theoretical problems within a larger

subject. Moreover, the objective of a scientific meeting may be the checking of the correctness of the approach selected by authors for developing their topic. In the latter case scientific meetings are held at the beginning and during the course of the research. A limited number of timely problems should be open for discussion at a scientific meeting in order to be able to discuss them within a short time. The holding of a scientific meeting usually includes the discussion of a report; it is desirable that the participants at the meeting be familiarized with the main points of the report ahead of time. The materials must be carefully studied and necessary conclusions drawn from them.

All kinds of other discussion occupy a significant place in the system of military science work. Various research studies, articles, reports and other military science studies prepared by whole groups or individual researchers can be discussed. Discussions can be held in groups of authors, in study groups and in the sections of a military science society, at special meetings, etc. The organization and holding of such discussions are similar to that described above. However, this is a more fluid form for conducting scientific work.

4. Organization and Hygiene of Mental Work

The first task of anyone engaged in mental work is the proper organization of his work in such a way that he can work with greatest productivity with the minimum expenditure of energy. In scientific work, like in any other field of endeavor, until a man has learned to work productively he is forced to expend far more time and effort on completion of work which is done readily and rapidly by persons having definite skills and habits.

Science and practical work demonstrate that definite requirements and conditions must be observed in order to achieve high mental performance.

In particular, it is necessary to learn to plan mental work properly in accordance with one's strength, knowledge, experience and the conditions of his army assignment. We do not refer to the general planning examined in Chapter V of this book, but the planning of time for each working day by the scientific worker.

It is better that the plan for tomorrow be prepared the night before, distributing all the work for the following day in a desirable sequence. This plan must be concise. It must include a list of impending work and

indicate the time in hours required for its completion. If in the course of executing one's army assignment during the planned day it is necessary incidentally to make some observations, notes, inquiries, etc., this certainly must be reflected in the plan. The existence of such a plan disciplines the researcher, safeguards him against purposeless expenditure of time and introduces organization and purposefulness into all his work. Moreover, the setting of definite times for performing a definite part of the work increases his work intensity and induces him to make an effort to complete what he has planned.

In planning those periods of the working day during which one will engage in mental labor, it must not be forgotten that in this type of work, like in any other, there is an initial period of adaptation, followed by a period of maximum productivity, which then gradually declines. This general physiological pattern requires that mental work be distributed during the allocated time in such a way that it begins with the performance of tasks of moderate difficulty. Then work requiring the greatest mental stress should be undertaken, leaving the easiest tasks to the end of the working day.

However, it must be said that an indiscriminate approach to this matter is inadmissible. Each researcher must take into account the general rules, but in organizing his work he must be governed by his own individual peculiarities. For example, there are individuals who have their greatest mental performance during the first hour of work. It is desirable that such workers begin their work with the most difficult tasks, gradually proceeding to easier ones.

The proper alternation of rest and work is a mandatory condition for high productivity of mental work.

It must be remembered that constant mental work in the same direction results in relatively rapid fatigue. To be sure, the rate of fatigue differs for different individuals, but it is nevertheless inevitable. By constantly neglecting the rule of alternation of rest in work the scientific worker can inflict great harm on his health. Fatigue, intensifying from day to day, can develop into a chronic form.

In order not to allow a reduction in performance, it is necessary that the onset of fatigue be noted in sufficient time and that the person have

recourse to some form of rest. The basic and most valuable form of rest is deep, healthy and sufficiently long sleep. In the breaks in mental activity a person can rest in different ways. For example, light physical exercises, pleasant conversation on a subject not requiring mental effort, jokes, mirth and laughter are useful. Playing chess or engaging in some other mental work during breaks is not recommended. On the basis of experience it can be recommended that the following breaks be taken in mental work: after 1-1 1/2 hours of work -- 10-15 minutes rest and after 4-5 hours work -- 1 hour rest.

Periodic alternation of occupation, replacement of one form of mental work by another, are among the means for facilitating an increase in performance and delay in the onset of fatigue. For example, writing is replaced by reading, the reading of a difficult article or a book by the reading of an easier one, etc., as well as the alternation of mental work with physical exercise.

V. I. Lenin attributed great importance to the alternation of occupations as means for rest. In a letter to his sister Maria Il'inichna, Lenin wrote: "I advise you to distribute properly your studies of the available books in such a way as to alternate them; I know very well that the alternation of reading or work, shifting from translation to reading, from writing to gymnastics, from serious reading to fiction, is of exceptionally great assistance" [1].

With respect to the duration of productive mental work, it varies for different people and is dependent on age, health, preparation, training, but most importantly on the attitude toward the work, understanding of its importance, interest and absorption. Many examples are known in science when individuals have worked for 10, 12 and even 16 or 18 hours a day in mental activities to their most advanced years.

It is usually assumed that the morning hours are the best for mental work because the brain has rested during a nights sleep. However, experience has shown that extremely productive mental work can also be done in the evening hours, particularly by those who have been engaged in some form of nonscientific activity during the day. Without losing some slight concern about their health, it must be remembered that all the great scientists have also been great workers. They were characterized by exceptional work capacity. P. La Farge, in recalling the work methods of K. [illegible] wrote:

"Although [illegible] always went to bed very late, nevertheless between 8 and 10 o'clock in the morning he was always up, drank black coffee, read the newspapers and then went to his study where he worked until 2 or 3 o'clock in the morning . . . during his youth [illegible] usually sat over his work all through the night. Work became a fashion to [illegible] ; he was absorbed in it to such an extent that he frequently forgot to eat. Many times it was necessary to call him to dinner several times before he finally came down to the table; scarcely had he eaten the last morsel and he again returned to his room" [2].

Academician N. N. Senenov, recipient of the Nobel Prize, spoke well of the difficulties and joys of scientific work, the need for expenditure of an enormous amount of work, particularly during youth. In addressing young scientists with a call to persist in science, work continuously, create, and have no fear of fatigue so as to achieve an unprecedented flourishing of our Motherland, he wrote:

"Science requires from man a concentration of all his spiritual and physical forces, a great passion and continuous work. Like a pianist must daily play the piano for many hours, like the composer must live amidst musical images day and night, even during distractions and rest, so also must the scientist work continuously on improving experimental methods and on analysis of experimental results, constantly reflecting on their importance and dreaming of new theories and the application of their results in the national economy.

"Visualize how much work is involved and how many sleepless nights and sacrifices are required by science and what a great passion man directs to this work. Fortunately, the longer a capable person is engaged in science the greater are the pleasures which he obtains from it, the greater is the indomitable passion which burns in him for attaining scientifc creativity and the more joyous and easier it becomes. The enormous expenditure of spiritual and physical energy necessary in order to become a real scientist is possible only in youth. If these efforts are not undertaken during the young years, these efforts will never become possible and a person will never become a real creative scientist" [3].

In order to ensure a high productivity of mental work it is necessary to have not only a rational organization of the work, but also create definite favorable surrounding conditions.

Mental work requires great concentration and attention. Accordingly, any noise, including conversations in the working room or at home will interfere with absorption in the work, will distract attention and be an extremely serious interference to the work.

The organization of the work site is of great importance for increasing the productivity of mental labor. The room for scientific work must be bright, the air must be pure and the temperature in the range 16-18°.

The light at the work site should fall from the left side.

One must teach himself to adhere to proper order on the desk. The book on which one is working should lie in the middle of the desk; to the right of it there should be paper for notes or those materials which must be frequently consulted or taken in hand during the course of the work; at the left of the desk there should be those sources which must be at the center of attention. At the left side of the desk one should keep the greater number of books necessary for the work so that it will be convenient to make notes from them.

It follows from everything that has been said here that in order to increase the productivity of mental labor it is always necessary to be concerned with its organization and one must reasonably adhere to the necessary rules of hygiene for this type of work activity.

Footnotes

1. To p. 319. Henceforth we will also use the term "study group" in referring to a section if the latter is not divided into study groups.

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13. ABSTRACT

This book gives an analysis of the methodology used in military-scientific-research. The authors examine the characteristics of such research and the Marxist dialectic method, logic and statistical method used in it; also discussed is the process of military-scientific research and recommendations on the literary finalization of a scientific work and on the preparation of a manuscript for the press; the methodology for organizing military-scientific work is discussed in detail. The book was prepared by a group of authors at the Military Academy Imeni M. B. Frunze. Since the experience in analyzing the methodology used in military-scientific work still has not been adequately generalized, and since a work of such a nature is published for the first time, the authors and publishing house ask officers and generals working in the military science field to send to the publishing house their comments, reviews, desires and recommendations of a practical nature concerning the contents, structure and form for exposition of the materials in this book. The address for such communications is: Moscow K - 9, Tverskoy Bul'var, 18.

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	ROLE	WT	ROLE	WT	ROLE	WT
Military Science						
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